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POPULAR MECHANICS

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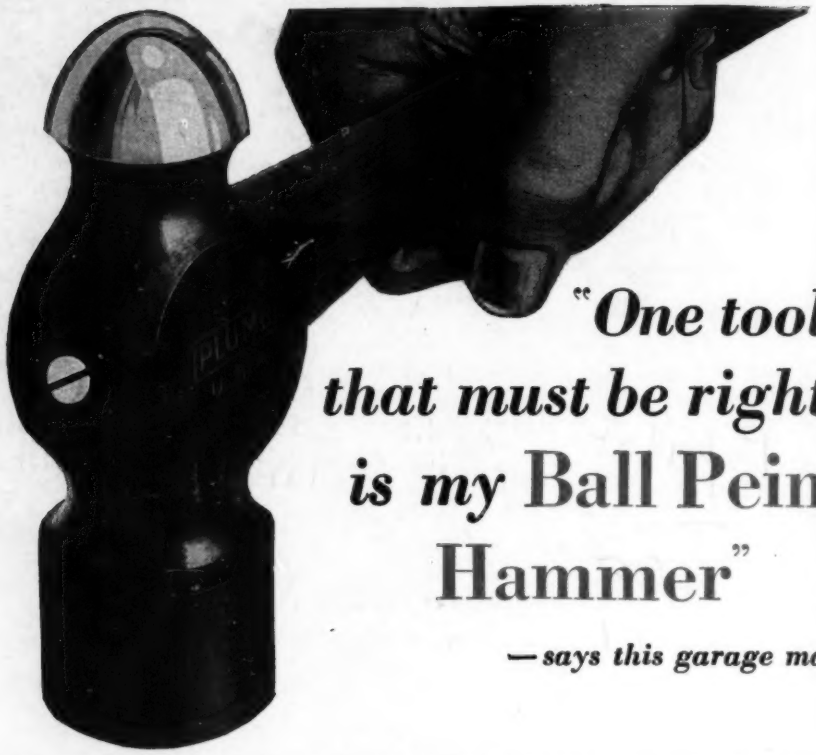

"One tool that must be right is my Ball Pein Hammer"

—says this garage man

"Power! Accuracy! Balance! I need those qualities in a ball pein hammer as much as I need strength in my right arm," says Edwin Bennett, Proprietor, Bennett's Garage, Avalon, N. J.

"Tearing down a transmission . . . driving off frozen parts when taking a job down . . . tapping a center punch . . . riveting . . . on these jobs accuracy counts. A false blow can do plenty of damage.

"Or removing a balky tire . . . straightening a kink in a rim . . . you want power there. Solid blows, with plenty of force.

"Plumb must have studied what garage men need before designing the Plumb Ball Pein Hammer."

An expert's tool! The head is mounted off-center to put more weight behind your blows. Oblong eye takes a sturdy, full-size handle. Cone-shaped pein spreads rivets instead of mashing them.

And the patent screw wedge tightens the handle (when it finally loosens) just by a turn of the screw.

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More Than Two Million Blows!

Straightening bayonets during the war, this veteran is estimated to have struck 2,400,000 blows. The pressure of the mechanic's hand wore grooves in the hard hickory handle, yet the face did not "mushroom" or chip. It is still good for years of service.

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Wireless Light Next?

Neon-Gas Beacon Recently Exhibited in New York; the Glass Ball in the Center Contains Only Neon Gas and Has No Electrodes; Energy Is Imparted from a Wire Coil

By WALTER RALEIGH

MORE light! The home, business, industry, aviation, are shouting for brighter, bigger and better lights.

Lighting engineers are hard at work seeking daylight brightness for the dark hours, but, as yet, they are a long way from that ideal. To prove it, pull down your blinds during the brightest day, turn on all the lights your room affords, then go out in the street for a few moments and return. Inadequate? Very much so.

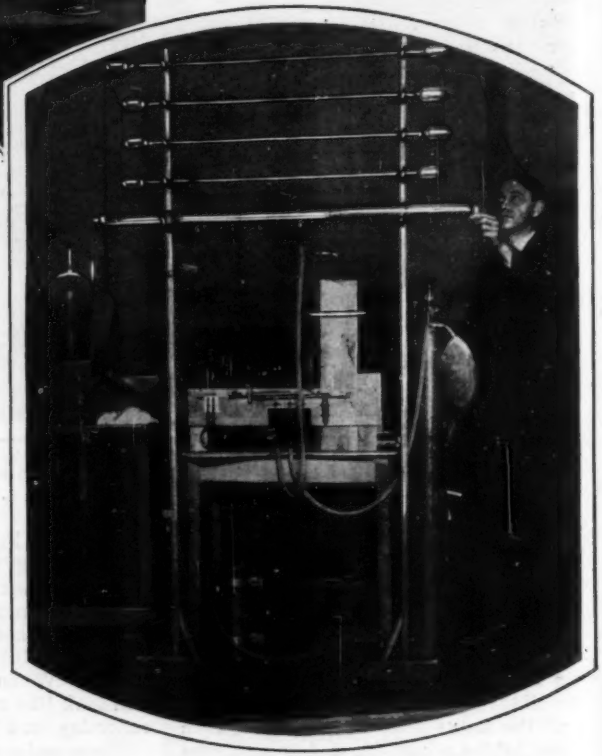
What is needed to be done has been all but done. For one thing, we are soon going to stop using hot-filament electric-light bulbs with fine wires to burn up and break and metallic vapor to blacken the glass. We are soon going to have glass globes absolutely free from metal inside or out. When they are not lighted, they will look like crystal spheres, beautiful as reflecting soap bubbles.

These spheres will contain gases that can be rendered highly luminous by a high-frequency current in a near-by coil

of wire. Probably the wire will be buried in the wall, with no signs of any outlet, or there may be a little recess in the wall in which the sphere can rest. This new magic of lighting already has been produced. Such lights are now in use. In fact their action is really not so very different from that of the large glow signs used for advertising purposes. These reddish, or sometimes bluish, white signs contain the rare gas argon, frequently mixed with mercury vapor. In each end is sealed a piece of wire, an electrode, and a rapidly alternating current at about 6,000 volts is applied.

But the same effect can be produced without a single wire. Utilizing the principle of the doorbell where, by pressing a button, the current is sent through a coil which repeatedly pulls a soft-iron hammer over to ring the bell, scientists discovered that in the neighborhood of a rapidly changing magnetic field the electrons in a gas-charged bulb are started first one way and then another, and light is produced. Thus it was evident that these new lamps needed only to be in proximity of the changing magnetic coils. These latter might be buried in a wall leaving no external evidence.

Such magic lamps are practically indestructible. The hidden wiring would no more wear out than any wiring in a wall of today would wear out. The lamps, in whatever shape they might be, would have to be broken by some hard blow in order to render them useless. They would cost less to manufacture because there would be no intricate internal wires to arrange



D. K. Wright beside a 50,000-Watt Lamp with Chimney to Prevent Its Melting, and Lighting Gas-Filled Bulbs by Exposure to High-Frequency Current

and support. Such lights would be cool, throwing out very little heat, efficient and cost little to operate.

A lamp of this type and kind has been made. A large one, wireless or radio style, was mounted on a tower in Schenectady, N. Y., and gave sufficient light so that a newspaper could be read at a distance of two miles.

The fact of the matter is that the night-flying birdman more than anyone else has stimulated the lighting engineer to do his best to meet the demands made for safely operated and equipped landing fields.

First came the narrow and powerful beam of light revolving slowly. This as a beacon helped. By timing a chain of such lights to make revolutions at various speeds, the aviator could tell one town from another. For a hundred miles such lights could be seen when weather conditions were good and for ten miles if poor.

But the neon light was the greatest help. These excited atoms, inclosed in glass, stirred up by high voltage, could be made to give out a reddish color, and a red light can be seen much farther through a fog or mist than any other color.

Experimentation is now seeking to produce them for domestic use. Here, however, the problem of eliminating the red glow or the too bluish glow will have to be soived.

Aviation's second problem relating to lighting had to do with illuminating the landing field and included boundary markers, with direction indicators. The red neon light has no special advantage here, since the ground would best reflect its own color. Giant lamps were tried to solve this problem. One of these is a new seventy-five horsepower lamp, being the largest ever built. The electric lights in our homes are but as insects compared with this giant. So powerful is this lamp that a special chimney arrangement had to be designed for it, so that it would not me't from its own heat. It gives 125,000 candlepower.

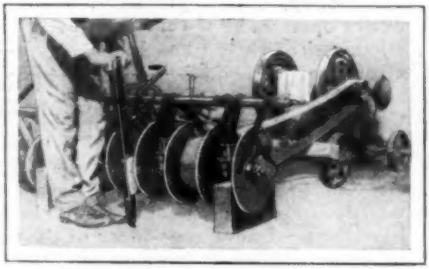
Microscope Lenses Attached to Spectacle Frame, to Leave Both Hands Free

MICROSCOPES ON SPECTACLES HELD BY CLIP

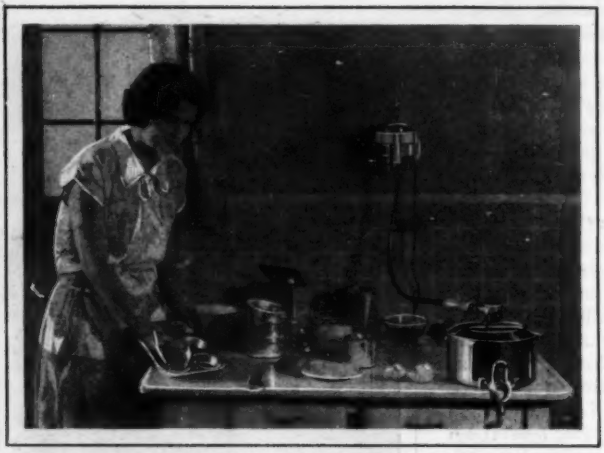
Attached with a clip to the frame of the spectacles, special magnifying lenses have been introduced for watchmakers, doctors and others who require a microscope. The glasses are focused simply by sliding them along the attachment by which they are connected to the spectacles. They leave both hands free and are adapted to work not requiring lenses of high power.

MOTOR DRIVES HARROW BLADES FOR RAPID SHARPENING

Disk-harrow blades are sharpened quickly and thoroughly with a special whetstone which is held against them as they are turned rapidly by power from a gasoline engine. All that is necessary is to jack up the harrow and hitch it to the engine with a pulley arrangement. The whetstone rests on the ground, giving great leverage.



Sharpening Disk-Harrow Blades with Engine Rig and Stone Held against Them as They Revolve



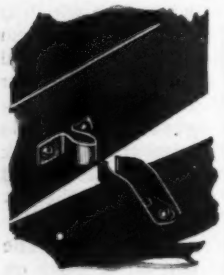
Mixer Connected for Operation; the Handy Electric Set Includes a Juice Extractor, Buffer and Emery Wheel

ELECTRIC SET MIXES CAKES AND SHARPENS KNIVES

Several useful kitchen aids are combined in a single electric set that is operated by current from a lighting circuit and is intended to save time and labor. Among the articles are a dough and batter mixer, a cream whipper and egg beater, juice extractor, buffer, rotary scratch brush for cleaning pots and pans, and an emery wheel for sharpening knives. The entire outfit is compact and simple.

CATCH TO HOLD DOORS SHUT PREVENTS SLAMMING

Quickly attached with but two screws, a steel catch holds all kinds of doors and windows shut and also acts as a buffer to prevent violent slamming. The device operates by friction, holding the door firmly shut, but not so tight that there is difficulty in opening it. It is especially useful on windows that have a tendency to open accidentally from the top, thus exposing the interior to harmful drafts.



POWER-LINE POLES OF METAL DEFY ANT ATTACKS

Engineers encounter many problems not met elsewhere in erecting power lines in Africa. For instance, the poles are made of metal to resist the white ants, or termites, that devour almost anything made of wood by eating it from the inside until it collapses. A further difficulty is found in that monkeys and baboons sometimes climb the poles and short-circuit the wires. To prevent this, barbed wire is wrapped about the poles to keep the animals away from the cables. Several feet of each pole, at a considerable distance from the ground, are protected with the wire.

SWING ASH TRAY SAVES ROOM AND PREVENTS DIRT

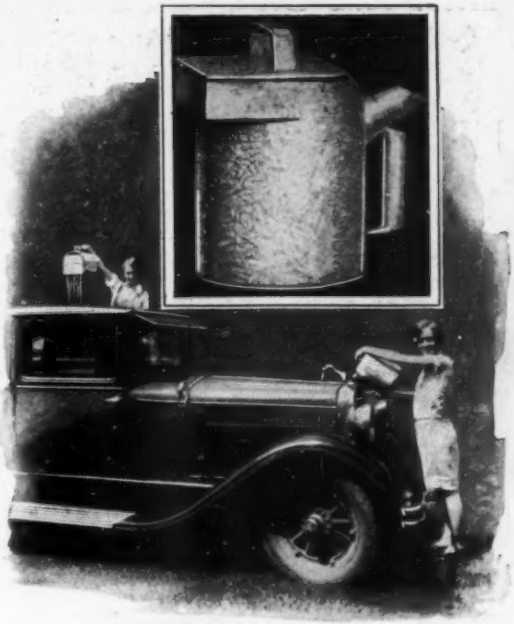
Clamped to the edge of a table or other convenient place, a deep ash tray can be swung out of the way when it is not in use. This saves room on the table for card or other games, the tray cannot be knocked over, and ashes are kept from spilling. The clamp has rubber protectors to prevent marring.

INVENTORS BREAK OLD RECORDS IN NUMBER OF PATENTS

About 3,000 more patent applications were granted during the last fiscal year than in the year previous, according to reports from Thomas E. Robertson, commissioner of the patent office. This is an increase of 17,000 over the number for 1924. The total for the last year amounted to 116,951.

NEW BUTTON MATERIAL GIVES LONG WEAR

Plastic albumen, a recent product of chemistry, has been introduced for the manufacture of buttons and is said to have greater strength, more uniform wearing quality and a more enduring color than some of the other materials used for this purpose. The innovation marks another step in the long and interesting history of the button, first used as an ornament, then as a support for clothing. They have been made from metals, glass, celluloid, and many other substances and have played a part in history. During the Civil War, when both the northern and the southern states were supposed to be dependent upon England for their supplies, quantities of them were manufactured in the north and smuggled to the south on the Potomac river, together with other articles. The button has been a favorite with collectors, and research workers have used it to confirm historical facts. A brass military button discovered at Nulato, in Alaska, apparently is a relic of a massacre which took place at that town in 1851, when the military post maintained there by Russia was destroyed and its inhabitants massacred.



Filling Radiator from Special Sprinkler; Using It to Spray Car, and a Close View Showing Oblong Nozzle

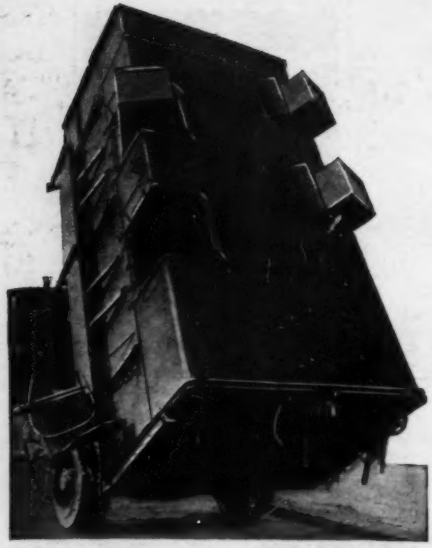
NOVEL SPRINKLING CAN USED TO FILL RADIATOR

A novel sprinkling can, which has several uses, including filling the automobile radiator, has been invented by a Chicago man. Instead of the usual spout and small round sprinkler head of the conventional can, the new one has a broad oblong sprinkler which will wet a much larger area. The can also can be used to spread liquid fertilizers or insecticides. An extra spout, rising above the handle, is provided for filling the auto radiator. Because of its location, the can does not have to be lifted as high as the ordinary type would. It is also useful as a minnow pail or for washing the automobile. When filling the radiator with it, the hands do not obstruct the view of the opening.

ASH TRAY DELIVERS CIGARETS AT PRESS OF LEVER

Ash tray and cigaret holder have been combined in a single article for the convenience of the smoker. The container holds twenty cigarets, delivered one at a time through an opening on the side by pressing levers. More than one kind of cigarets may be distributed, a second pressing of the levers taking back the cigaret already ejected and delivering another.

Cigaret Dispenser and Ash Container in One; Levers Shown at the Side on the Right



Refuse Truck on End for Quick Dumping; Side Openings for Filling Are Fed from Small Cans

SELF-EMPTYING AUTO TRUCK SPEEDS STREET CLEANING

Loaded at the sides through openings that have separate lids, and emptied by being elevated at a steep angle so that the contents will run out at the rear, a special automobile truck used in Berlin, has been found of aid in street cleaning and similar jobs. It eliminates extra handling of the material and also prevents dust from spreading.

MORE WOMEN THAN MEN FLY ON ENGLISH AIR LINE

Shopping trips to Paris apparently explain why so many more women than men cross the English channel from London by the Imperial Airways lines. In a recent six-month period, more than 14,000 women were carried and every week end, hundreds make the air journey. The average weekly business is about 2,000 passengers. In all, the lines have flown 3,800,000 miles without a fatal accident. But human cargo is only part of the traffic. Gold, silver, precious stones and silks are included in the air shipments, while live animals are carried frequently. Not long ago, one plane arriving from Rotterdam held fifty parrots, a small bear, a monkey and a tank of tropical fish. Pets, pigs and chickens are commonly carried and recently, a full-grown lion was taken in a special cage from London to Paris. Because of the safety of the traffic, insurance companies are charging lower rates on some goods by air than by land transport.

POLICE DOG TRAINED TO PICK COIN FROM MANY OTHERS

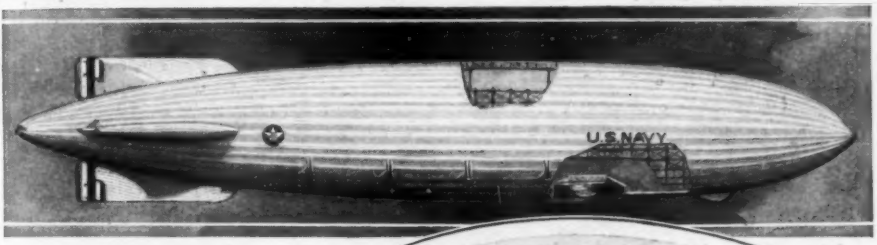
In a recent police-dog field trial held near London, one of the contestants was so well trained that it could pick out of a pile of coins one which had been held by its master for only a few seconds, and could still locate and retrieve the coin after it had been handled by several other people. The dogs were required to lie quiet in a field for fifteen minutes after their masters had walked away and left them on guard; to refuse meat offered by strangers; stop at a signal when running full speed, lie down or return and retrieve articles hidden 300 feet away; and to pick out a "criminal" from among a crowd and hold him at bay.

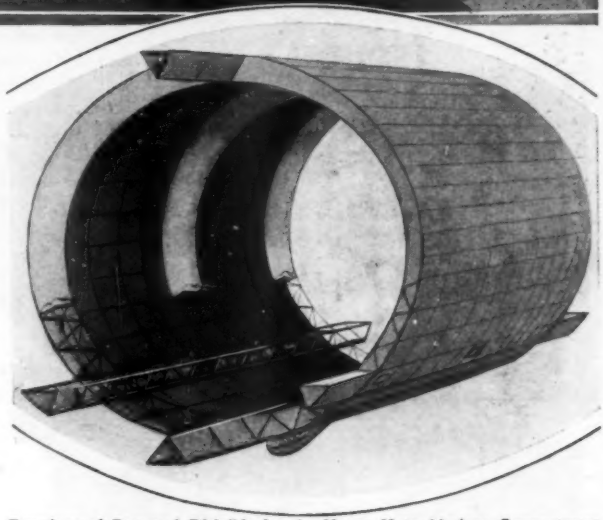
ORNAMENTS GLUED TO WOOD DECORATE FURNITURE

Ornaments of a composition wood material, pressed into attractive patterns, are now on the market for decorating furniture and other articles. They are to be glued on and colored as desired. A special adhesive makes them stick firmly to metal, paper, glass or wood.

Samples of Composition Ornaments Which Are Used as Substitutes for Carved Decorations

AIRSHIPS TO HAVE TRAPEZE FOR CATCHING PLANES



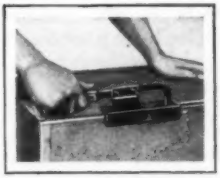


Drawings of Proposed Dirigible for the Navy; Note Airplane Compartment and the "Cat Walks" the Full Length of Ship

Five scouting airplanes will be carried in each of the two huge dirigibles planned for the United States navy, and to provide the best equipment for handling the planes, interesting tests are being conducted with the "Los Angeles" and an observation plane. The latter unit has been fitted with special hooks over its wings for suspending it from a triangular trapeze attached to the frame structure of the dirigible. In actual practice, the plane would fly under the big ship, and the hooks would be attached to the trapeze, which would then be used to swing the plane up into its hangar in the framework of the dirigible. To launch the airplane, the locks that hold it when it is finally in place, would be automatically released, allowing the plane to drop down in position for flight. The two new dirigibles, the "ZRS-4" and the "ZRS-5" will each have a gas volume of 6,500,000 cubic feet, will be 785 feet long and, at fifty knots, can cruise 9,180 miles without refueling. Each will have eight motors with a total capacity of 4,480 horsepower. An interesting feature of the engines is that they will be housed inside the body of the ship to decrease wind resistance and to give greater safety. The propellers will be driven through transverse shafts and their axles can be turned into the vertical position to exert an up or down thrust to assist in taking off and landing. Access to all parts of the ships will be afforded through three passageways.

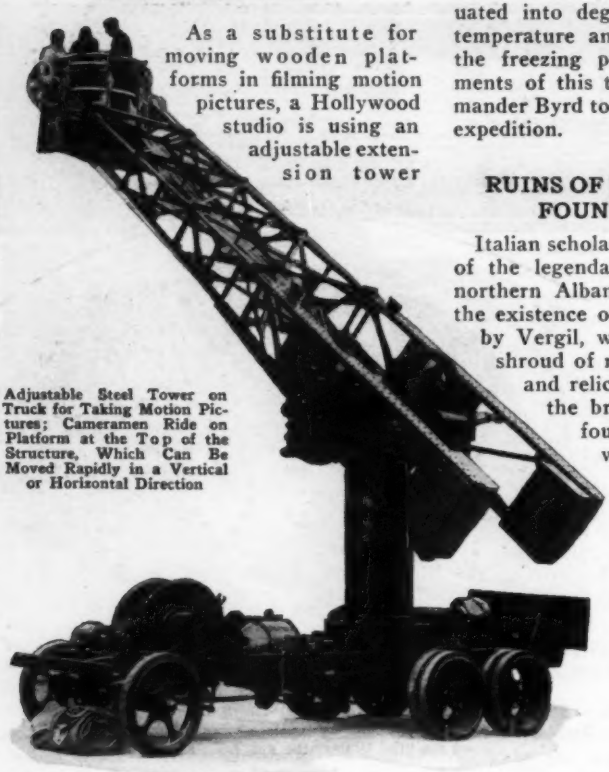
KNIFE TO OPEN PAPER CARTONS PREVENTS DAMAGE

Paper containers are opened easily and quickly with a special knife that prevents damage to the contents and leaves the box in such shape that it may be used for reshipping. The cutting blade is held in a guide or shoe which keeps it from penetrating far into the carton, as sometimes happens with an ordinary knife. The blade may be removed for sharpening, and the tool is safe and strong.



TRAVELING TOWER FOR MOVIES AIDS CAMERAMEN

As a substitute for moving wooden platforms in filming motion pictures, a Hollywood studio is using an adjustable extension tower



Adjustable Steel Tower on Truck for Taking Motion Pictures; Cameramen Ride on Platform at the Top of the Structure, Which Can Be Moved Rapidly in a Vertical or Horizontal Direction

that can be moved 600 feet a minute horizontally and 400 feet per minute in a vertical direction. It can be swung to almost any angle and at any height within its range and has special adjustments so that the operators of the cameras can be actually going in eight different directions at once, according to reports. This permits unusual "shots," saves time, and makes possible unique effects in the finished films. The tower weighs 1,000 pounds.

PILOTS ARE GIVEN WARNING OF ICE ON WINGS

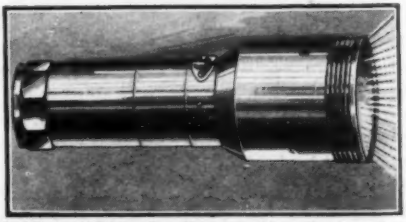
To inform the pilot when ice is about to form on the wings of his plane, a special thermometer has been devised. It consists of a bulb attached to the leading edge of the wing or one of the struts. A tube leads from it to the instrument board, where a hand, moving over a dial graduated into degrees, records the outside temperature and warns the pilot before the freezing point is reached. Instruments of this type were made for Commander Byrd to be used on his South Pole expedition.

RUINS OF MYSTERIOUS CITY FOUND IN ALBANIA

Italian scholars recently found the ruins of the legendary city of Buthrotum in northern Albania. Until this discovery, the existence of such a place, mentioned by Vergil, was doubted, but now the shroud of mystery has been removed and relics that date back as far as the bronze age have also been found on the site, together with the statues, baths and other evidences of Greek and Roman times. In the middle of a laurel grove, a sacred well was found. Elaborate mosaics indicate that the citizens of Buthrotum were worshipers of Neptune.

FLASHLIGHT HAS OWN DYNAMO

Current is generated by a spring dynamo in a flashlight that requires no batteries. Electricity is supplied from revolving magnets simply by turning a spring in the handle. No oiling, adjusting or brushes are required. The light is especially suitable for service where dependability at all times is important and where batteries are difficult to obtain.



Flashlight Which Supplies Its Own Current from Spring Dynamo Inside

'Quake Warning Saves Lives

Aerial View of Mount Etna, Sicily, While the Crater Was Pouring Streams of Molten Lava down the Mountainside to Blot Out Villages Clustering beneath the Volcano

By ORVILLE H. KNEEN

FOR more than 2,400 years men have fled in terror from Etna's fiery outbursts. Records show that from 115,000 to 145,000 lives have been lost on the slopes of the volcano—sacrifices to the lure of its extremely rich soil.

But, in its latest eruption, not a single life was lost as it was predicted two years in advance.

When a new mouth opened some 6,000 feet above sea level a short time ago, a broad river of white-hot molten lava, a mile in width, started for Sicily's fertile fields below. As the residents began a hurried retreat by motor, railroad and every form of conveyance, volcanologists and engineers mobilized their forces. For the first time in history, they determined to wage war on Europe's greatest volcano.

Rapidly into the beautiful Pietrafucile-Vallonazzo valley swept the river of molten rock, fourteen feet deep. So intense was its heat that houses and trees a hundred yards in front burst into flames. Another crater opened violently, lower down the slope. Straight toward the villages of Mascali and Nunziata crept the torrent, leaving destruction in its flaming wake. Mascali, a town of 10,000, was soon seen to be doomed.

But other villages might be saved. With high explosives engineers began to dynamite the railroad bridge, to turn the flow southward. Soon it poured over another bridge, melting iron rails like butter. Power lines and aqueducts were cut in two. As one fiery river slowed its flow, another branch would reach out deadly tentacles. One of these began a threatening advance on Giarre.

To save this city now absorbed the efforts of thousands of soldiers, engineers and workmen. As fast as they could be planted, hundreds of mines were exploded around the northern and western outskirts, to create a great stream bed and thus divert the lava river into the sea. A huge earthen wall quickly was erected. Three streams were now advancing from the crater, with half a dozen villages in

Making Movies on the Still Warm Lava beneath Mt. Etna, Top, and Prof. Alfonso Sennino Studying an Eruption of Vesuvius

their path. Enormous clouds of steam and dust arose, while the earth shook from internal disturbance. In seventy-two hours the streams had traveled over six miles, over five times as fast as in 1923, the year of the last notable outbreak.

It was then that Prof. G. Ponte, head of the Etna volcanology institute, a lifetime watcher of the fire-breathing giant, determined to inspect the crater closely. He asked for an airplane, and at the risk of his life, soared over the peak. From a great height, above the clouds of smoke and fumes from craters and burning forests and towns, he saw liquid lava rising steadily from the main craters.

No electric lights remained in the whole area of many square miles, for power lines and plants had been destroyed. But at night the sweeping river could be traced almost to its source, a sullen stream of dull red, winding down the mountain like a fiery dragon. Above it, the sky glowed fitfully as the crater boiled and opened its white-hot jaws. For miles, burning trees flamed like giant torches, and man-made explosions were answered by detonations of gas pockets, as the terrible heat distilled subterranean materials.

On November 12, Professor Ponte noted the beginning of Etna's armistice. The quantity erupted was decreasing, he observed. Thus he brought reassurance of an early cessation, though warning that activity

Dust caused by fragments being pulverized in re-ejection after falling back
Molten Lava heaves soft up and down in Crater
Escaping gases ignited by contact with air
Wind caused by upward rush of heated air
Stream and
emitted
Clarke
1923
Nov. 2
3 Fissures open
Nov. 3
Fissures
Y Y Layers of ejected fragments, large near old craters and graduating to dust at a distance
forced through an
along layers
point

© S. W. Clatworthy

Artist's Drawing of a Cross Section of Mt. Etna, Showing Many of the Cones through Which Past Outbreaks Occurred, and, in the Background, the Huge Central Crater

Close-Up of the Smoke and Dust Cloud Hovering over Vesuvius during a Recent Eruption of the Famous Volcano

was still possible. But it was now ten days, and, as expected, Etna did begin to subside. Steam-and-ash clouds from the main crater, as in former eruptions, heralded the advent of peace, unless fresh material should enter the great subterranean reservoirs.

Once more Professor Ponte soared over the peak, finding all lava streams and branches slowly blocking themselves by solidifying heads. Only by the push of interior lava, still fluid, did they advance a few yards an hour. "This eruption," Professor Ponte predicted confidently, "will not delay in showing its final phases and in extinguishing itself."

Another observer, Professor Platania, who has seen many previous outbursts, predicted alternate renewals of activity with the advent of the new moon. This brings the greatest ocean tides, and also, some believe, earth tides, which Professor Platania has found to affect eruptions from "the inferno of the earth."

The total damage done by Etna, in this last outburst, will run from ten to twenty million dollars. Land worth up to $2,500 an acre has been destroyed for centuries, until the lava decays to form the richest of all soils. Buildings, roads, railways, bridges, telegraph and telephone lines, power lines and plants and aqueducts destroyed by the three lava streams will require millions and years to replace.

Yet, in all this destruction, not a single life was directly lost. To scientists who are giving their lives to mastering the habits of volcanoes, future generations will owe their safety and that of their property. It was predicted that the 1928 eruption would coincide with the year of maximum sunspots.

From the beginning of an eruption, through its most violent phases, to the period when sulphurous gases foretold the end, scientists like Prof. Alessandro Malladra are constantly on guard.

Close to 100 eruptions of Etna have been recorded, some very violent. From the depths of the earth, the spouting mouths, of which several hundred are still visible, have emitted white-hot lava, sulphur, sulphuric-acid gas, vapors of ammonia salts, hydrochloric-acid gas, and enormous clouds of steam and ashes. Such ash is by far the richest fertilizer known.

Prediction of eruptions is undoubtedly close at hand. Dr. T. A. Jaggar, world's most eminent volcanologist, has gathered a mass of data as to tilting of the earth cover near the bases of volcanoes, notably those of Hawaii. From scores of holes, ten feet deep, bored through the rock crust of Kilauea, he expects to be able to foretell eruptions when temperatures suddenly increase.

Earthquakes have been found to precede eruptions of some volcanoes, and seismograph studies have proved of value in predictions of disaster. Long-range

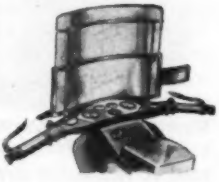
The Walls of Mascali, Sicily, Crumbling under the Millions of Tons of Molten Rock Poured into the Village by Mt. Etna; the Town Was Buried a Hundred Feet Deep

predictions may become possible through further study of sunspots and earthquakes.

We also are closer to making the volcanic cone work for mankind. Volcanic steam is used in several places for producing power and heat, notably at Larderello, Italy, and near Sonoma, Calif. Scientists speculate on the possibility of tapping reservoirs of molten rock, or the zones of great internal heat, for power plants.

But the taming of volcanoes is still far distant. And of the 400 or more active cones, Etna bids fair to continue as one of the most restless and destructive.

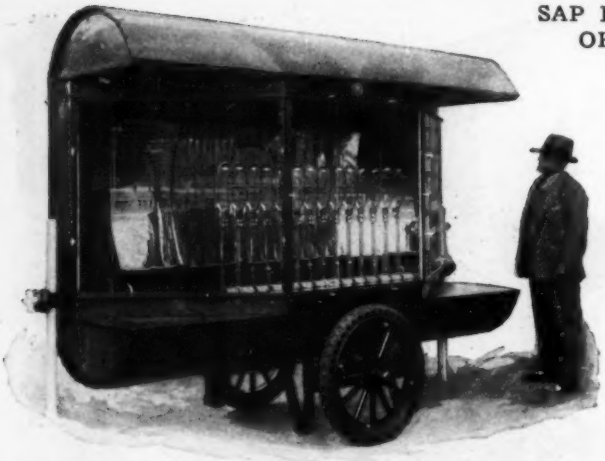
HYDRAULIC-BRAKE MOTORCYCLE HAS AUTO FEATURES



"An auto on two wheels" is the description given a motorcycle of recent British manufacture. It has a hydraulic braking system, a combined dash and handlebar, surmounted by a telescoping screen shield, and special plungers that can be lowered by pressure on a knob to hold the machine upright when no wall or curb is handy. Over the handlebar is mounted an instrument board such as would be found in the ordinary automobile.

TOWER BUILT TO STUDY EAGLES IN FLIGHT AND ON NEST

Excellent motion pictures of eagles have been obtained from an eighty-foot tower erected near Vermilion, Ohio, where a nest, only forty feet away, offers many opportunities for such photography. The location is one of the few places on the eastern half of the continent where the study can be made, and the present tower, a steel structure, is the second to be built. The first was blown down in a storm. The nest, which also crashed at that time, was about fifty years old and enabled naturalists to determine much of the food habits of the birds. The eagles never clean house and this particular nest, with all its debris, weighed about two tons. Prof. Francis H. Herrick of Western Reserve university has been conducting the eagle research since 1922.



Airport Landing Light, Equipped with Fourteen Incandescent Globes Generating Three Billion Candlepower

BIG LIGHT FOR LANDING FIELDS SHIELDS PILOTS' EYES

Rays from a 3,000,000,000-candlepower floodlight for airplane-landing fields are directed downward, close to the ground, so that they will not shine in the eyes of the pilots as they descend. The big light has fourteen powerful lamps, and is said to be so brilliant that a person can read a newspaper in its light at a distance of one mile.

HUMIDIFIER FOR AIR FURNACE HELPS GUARD HEALTH

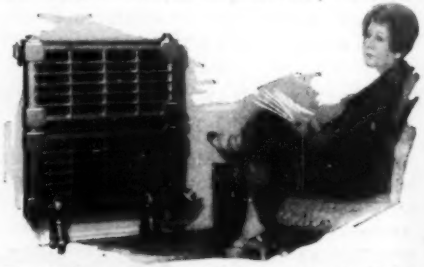
Keeping the air inside rooms properly moist is highly important to health and comfort and, to aid in this, an automatic humidifier for the hot-air furnace has been introduced. Its most interesting feature is that the tendency of wood to expand and contract under varying moisture conditions has been utilized to insure the proper amount of water for evaporation over the furnace. When the fire is started and hot air rises, a staff of cross-grain wood contracts, the action causing water to drop into the pan over the furnace where it is evaporated. When the air becomes saturated, the wood expands, closing a valve which shuts off the water. The device is said to be reliable and easily installed.

SAP IS PULLED TO TOPS OF TREES BY TENSION INSIDE OF TRUNK

A solution of the mysterious manner in which sap rises to the tops of trees has been offered by Dr. D. T. MacDougal, who has conducted extensive experiments with the phenomenon. He declares that the liquid is drawn up through tension caused by evaporation on the surface of the leaves and transmitted through the leaf stems, twigs and branches until it reaches the trunks and spreads down to the roots. He also found that air confined in dead vessels of a tree trunk, forms a single connected system, just as the sap does. This was shown by applying pressure instruments to different parts of the tree. Change in pressure at one point was rapidly transmitted to others.

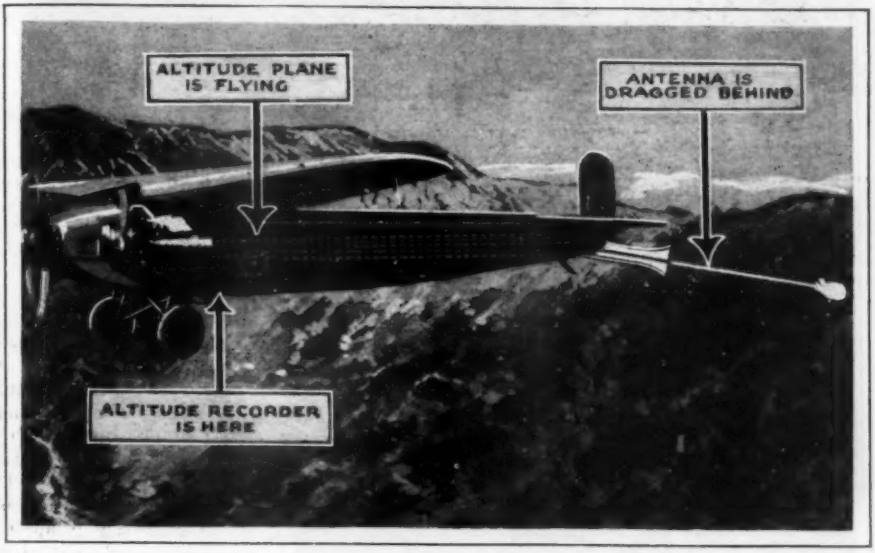
STEAM HEAT BY ELECTRICITY LATEST HOME COMFORT

In localities where low current rates are enjoyed, an electric radiator has been used successfully. Each is an independent unit and functions for about three months with but one pint of water. Steam is generated by contact of the water between the poles of an electrode instead of an element. This allows automatic shut-off of the current if the water evaporates or is lost by leakage. A switch gives full heat control, and little current is consumed.



Electric Steam Radiator Which Requires No Piping; Water Is Vaporized between Two Electrodes

RADIO SQUEALS MAY SAVE AIRPLANES IN FOGS

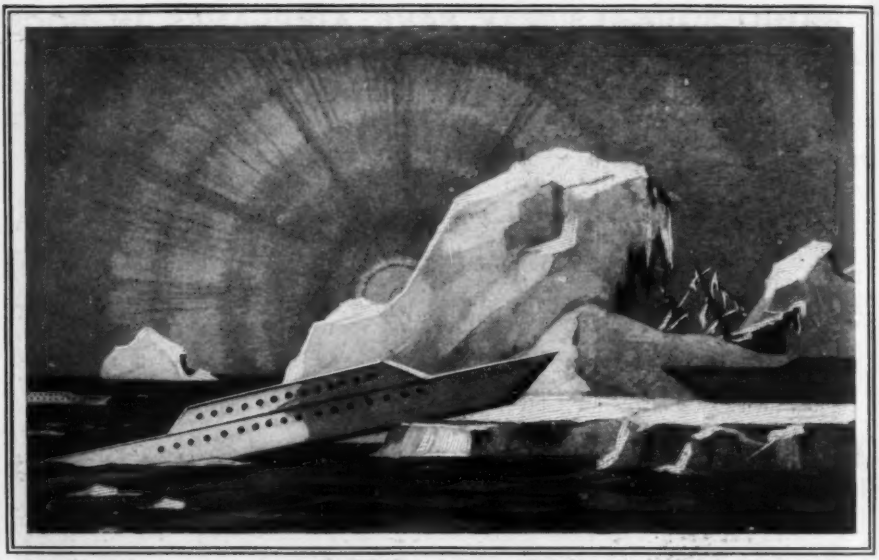


Tri-Motored Plane Used by Doctor Alexanderson in Tests of New Radio Altitude Finder; an Antenna of Unusual Design Is Dragged behind the Ship to Transmit Signals

Utilizing the squeal which annoys the radio listener when a neighbor overworks his regenerative receiver, to save airplanes from flying into the ground in a fog, is the latest development of science suggested by Dr. E. F. W. Alexanderson, famous television inventor and consulting engineer of the General Electric company. Professor Alexanderson has been experimenting for some time with an airplane altitude indicator designed to show the exact height of a plane above the ground. A signal, corresponding to the squeal of a regenerative set, is sent out from a transmitter in the plane, and the "echo" of its return from the ground picked up by a receiver. If the plane is 100 meters above the ground and a 100-meter wavelength is used, one full wave, like a letter "S," would carry the signal to the ground, and another full wave, completing a figure "8," would bring it back. The problem, however, is much more complicated than that. As a result of the experiments with recording apparatus, Dr. Alexanderson suggests it may be possible to get a continuous chart of the distance above the ground, or, by using two transmitters with antennas adjusted for slightly different wavelengths, obtain a variation in signals which will reach their maximum at certain specified points, so that a descending plane can check its height at regular intervals, down to within a few feet of the ground.

SPONGE-NOZZLE AUTO WASHER PROTECTS FINISH

To save time and work in washing the automobile, a special nozzle attachment for the hose has been introduced. It contains a large sponge and is made of rubber to prevent damage to the finish. The user may handle it with less likelihood of scratching the car, and it saves bending over and wetting the feet and clothing, as spattering is eliminated.

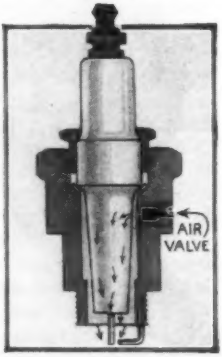


Proposed for Journeys in the Frozen Seas; the Turbine-Propelled Steel "Water Sled" Intended to Withstand Severe Pressure and to Slide over Icebergs

STEEL BOAT FOR ARCTIC TRAVEL RUN BY AIR TURBINES

Constructed of heavy armor steel and propelled by wind-pressure turbines, a special boat has been designed by a German engineer for travel through the ice fields of arctic regions. It is shaped somewhat like a giant sled.

SPARK PLUG WITH AIR INTAKE HELPS SAVE GASOLINE



Better combustion, fuel economy and cleaner firing points are among the advantages claimed for a spark plug with a patented air valve, which allows air to pass into the cylinders. The unit is so constructed that the suction stroke of the piston opens the valve and the compression stroke closes it. Operating automatically, it requires no attention, and is said to increase the pick-up and decrease the hazards of poison gases from the exhaust.

TYPE IS SET BY TELEGRAPH TO SPEED NEWS

Two newspaper type-setting machines were operated by telegraph wire in a recent test. Dispatches were sent on a punched tape which was duplicated at the receiving end, and as this second ribbon passed through a small unit, the holes were translated into electrical impulses which actuated an apparatus roughly resembling a human hand. Metal fingers released letters and characters into the type setter as accurately as though a human operator had pressed the keys. The demonstration was made in a newspaper office, the sending set being on one side of the room and the receiver on the other, but the wire was made the equivalent of a distance of 140 miles by resistance coils. Should the innovation prove practical, news dispatches would appear in print much more rapidly than is now possible, as the type could be set directly from a central office. The system is essentially like the electric-typewriter way of duplicating what is written far away.

HOMESTEAD LAND STILL AVAILABLE

According to government reports, there are about 300,000 square miles of free land in this country, still open to the home seeker. Practically all of it is in the west, although some tracts are available in Florida. That the frontier has practically disappeared, however, so far as agriculture is concerned, is seen in the statement that the "remaining vacant public lands, not mineral in character, are chiefly valuable for grazing purposes, though some tillable land may be found." Of all the land that is left, there is but little upon which a farmer could make a living even if conditions were more favorable than they now are, persons who have investigated the areas declare. Special offers have been made to ex-service men to file on certain tracts that have been held up to the present time for ammunition depots and for the Indians. More than 70,000 persons have made entries for homesteads upon which final proof has not yet been presented.

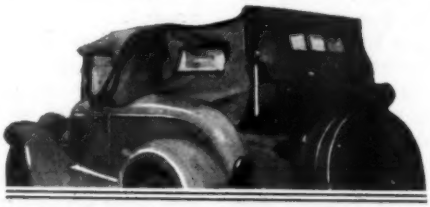
Weather Bulletins Posted in Spaces Opposite Towns on Large Map, Give Motorists Aid in Planning Tours

GUIDE MAP TELLS WEATHER TO AID MOTORISTS

So that motor tourists will know what sort of weather to expect in different parts of the country, a London automobile association has devised a special guide map. Instead of the usual waving lines and other technical details of a weather chart, this one shows conditions by small printed bulletins inserted under the names of important cities. The blanks can be changed to conform with the latest reports and the map can be read and understood by anyone.

TOP OVER AUTO RUMBLE SEAT HAS SIDE CURTAINS

Top and side curtains of a cover for the automobile rumble seat, roll into one piece that fits into a metal container attached to the back of the car. When only a sunshade is needed, the side curtains are folded under the top. The canopy can be adjusted even when the car is running.



Rumble-Seat Top with Side Curtains Offers Complete Protection from Sun and Storm

¶Carrier pigeons habitually fly only in the daytime.

Flying

Shooting the Sun with a Special Sextant, Which Carries Its Own Horizon, for Aerial Work

By LELAND S. JAMIESON

"WHERE are we?" yelled the pilot as the roar of the motor died away after he cut the throttle. "I'm lost!"

The passenger looked around in all directions at the haze of rain that shut off the horizon. He looked down 200 feet at the fields that were black and glistening with standing water. He held up his hands and shrugged his shoulders.

"How much gas we got left?" he asked.

"About an hour. We should have been home thirty minutes ago, but we're off the map and I don't know where we are."

"Let me see that map!" commanded the passenger, himself a pilot and a skilled cross-country flyer.

The pilot handed the map forward, then crouched down in his cockpit and, from the protection of his windshield, searched the ground for a field sodded enough so that he could land the ship without nosing it over. But the only fields he saw had water standing in the furrows. The passenger a moment later cut the throttle.

"Turn around and head back about forty degrees from the way you've been coming," he said pointing, and again bent his head over the map.

The pilot turned around and headed back. His compass was pointing southeast after the turn was made. It had been pointing south before. It told him nothing. "Gosh," he muttered. "This is the third time I've been lost in the last two weeks."

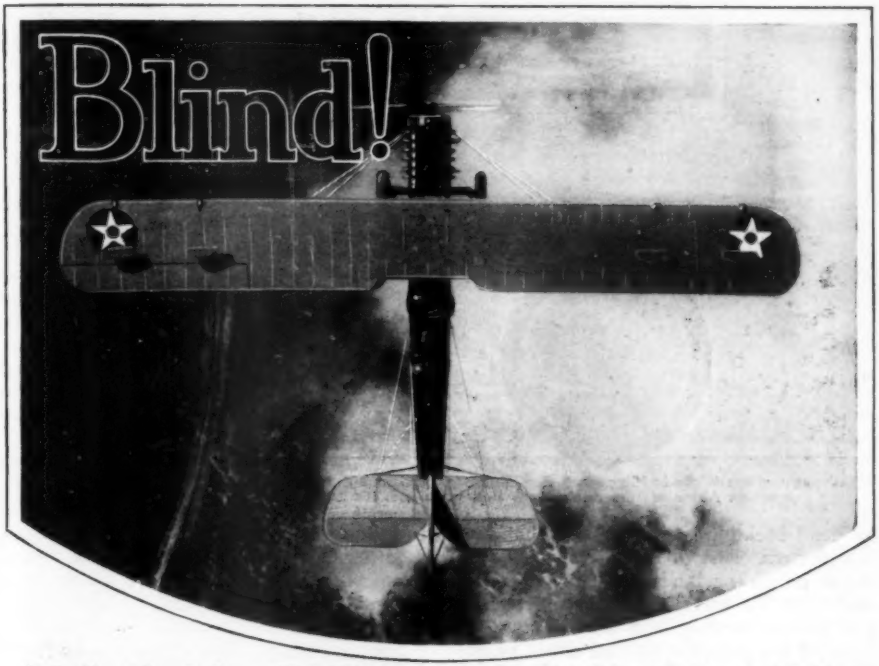
Suddenly the passenger pointed off into the rain to the left and signaled for a slight turn. The pilot headed into the blur of mist from a new tangent. Within a few minutes he saw the landing field.

"I don't see how I get lost so often," he complained, when they were on the ground.

"I don't see how you ever find the way home," was the reply.

"It's these strip maps I'm using. It's easy to run off of 'em. They ain't very wide."

"Only about fifty miles on each side of your course. The trouble with you is that you don't see anything when you fly over it; you don't make things on the ground



As the Airman Sees the Country While Flying above Broken Clouds; the Railroad Track on the Left Serves to Check Position and Insure the Accuracy of the Compass Course

match up with your map. And you might get your compass fixed so you can tell which way you go," said the passenger.

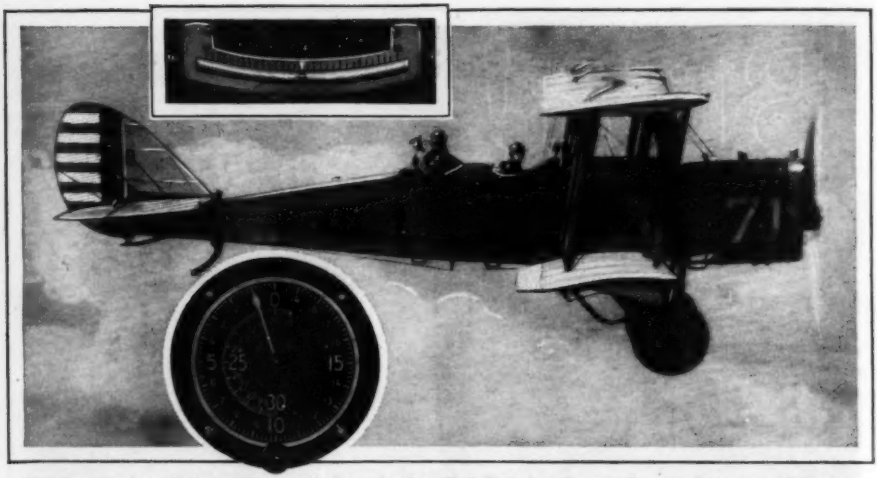
The easiest and simplest way to fly an airplane cross-country is to sit up above a railroad and watch the ties flow away behind you until you get home, but that method has disadvantages. The railroad may not go in the direction you want to fly; it isn't the straightest line between the two points, and you therefore lose time by following it. Then, too, if you are flying over an area where there is a network of railroads you never can be quite certain that you follow the right one.

The experienced pilot, then, usually draws a line on his map that connects the two places between which he expects to travel, and tries to follow that line, which is called the "flight line." If a wind is blowing across the line of flight, it will produce drift, and the pilot must turn slightly into the wind in order to maintain the correct path, or track, over the ground. In the vernacular of flying, the course of the ship is the direction in which it is flying, regardless of its track due to crosswinds.

Thus, in case a pilot is about to fly from one point to another directly north of him, he draws a line on his map between the two points and tries to follow a corresponding imaginary line over the ground.

Maps are made to be read, just as books are read, but they have signs and symbols of their own. It is as essential that an airplane pilot be able to read a map as it is that he read his oil-pressure gauge or his altimeter. A good map is a very small replica of the area it covers, except that it shows only the main features of the ground below, such as railroads, towns, rivers, paved highways and other similar prominent landmarks. To get the idea of how a good map for aerial use looks, imagine one that shows all the railroads and towns that are marked on an ordinary map, all the roads on a highway map; all the contours, hills and rivers as on an engineering map, and other less pertinent data, such as electric transmission lines.

In Lindbergh's flight to Paris he flew

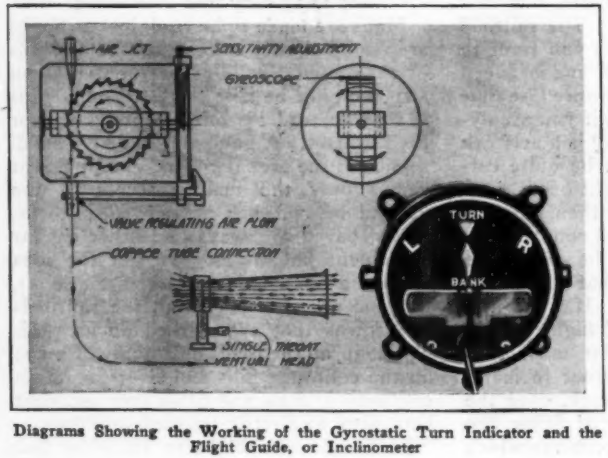


Shooting the Sun While in Flight, and, Top, the Steel-Ball Bank-and-Turn Indicator; Below, the Dial of an Airplane Altimeter; the Knob at the Bottom Rotates the Dial for Different Ground Levels

by dead reckoning from Nova Scotia to the western coast of Ireland. He had no check points or landmarks by which he could tell his location over the Atlantic, but, before leaving land on the western coast of the Atlantic, he had check points all along the coast from New York, and before he pushed out to sea, he had a point of departure that served as a check point in determining his correct course.

In cross-country flying the pilot relies upon two main check points: the initial check and the final check. The initial check is one which he may use a few minutes after taking off to determine whether he is headed in the right direction. The final check is one which tells him definitely that he is at his destination, or nearing it.

Suppose that a pilot started to fly from Dallas, Tex., to Oklahoma City, Okla. Before the trip, he would draw a flight line on his map connecting the two cities, then he would measure the direction in which that line extended, beginning at true north and counting around the points of the compass in a clockwise direction. Oklahoma City is roughly thirty-three degrees west of north of Dallas, but the pilot, instead of saying it in that way, says that the direction of Oklahoma City from Dallas is 327 degrees. Now, if there is no wind blowing across his course, the pilot can take off, turn his ship so that the compass reads 327 degrees, and, if the compass is correct, fly in that direction until he gets to Oklahoma City. To check against possible cross-winds in the air, he will look down along his fuselage and sight at objects on the ground as he



Diagrams Showing the Working of the Gyrostatic Turn Indicator and the Flight Guide, or Inclinometer

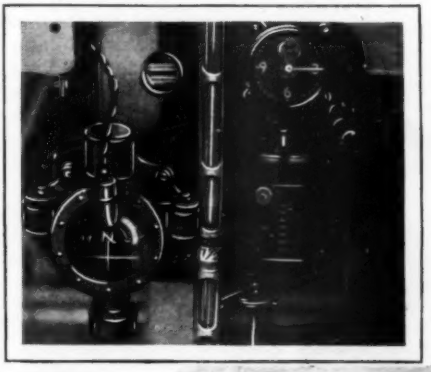
passes them. In this way he can tell whether the ship is traveling over the ground in the direction it is flying through the air or is drifting.

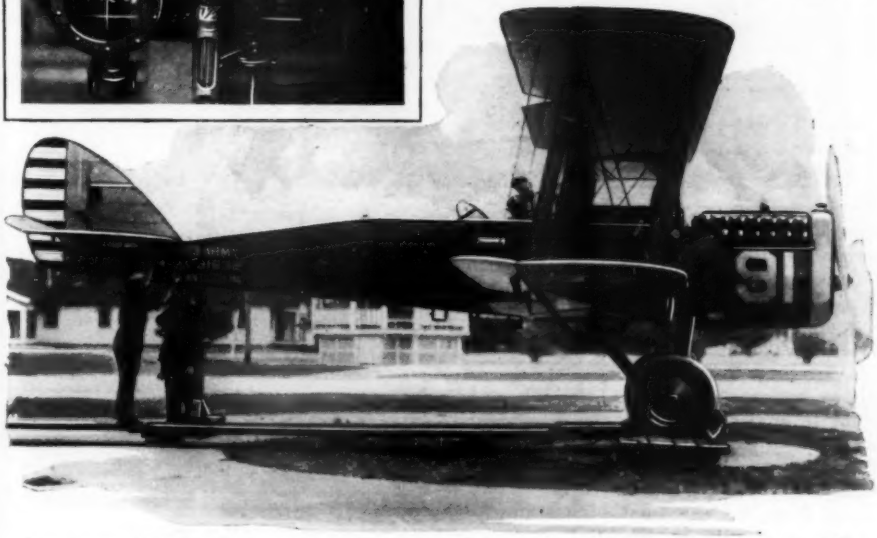
About twenty-five miles northwest of Dallas is a small lake, and the pilot's flight line passes about three miles to the east of it. It is the initial check point on the route, and after flying about seventeen minutes, if he finds himself opposite this lake at a distance of three miles, he knows that he is directly on his route, and making approximately 100 miles an hour over the ground On this particular flight there are check points at intervals of about fifteen miles and unless the pilot runs into low clouds, rain or fog, there is little excuse for his becoming lost.

Yet getting lost is just as common among young pilots as it ever was. Experience seems to be the only way in which a man can learn to recognize from the air the points along his route of travel that will guide him accurately He may mistake railroads for highways; he may pass up a small river for a creek, or a swollen stream for a river that is a key check point on his route. He may perhaps go above the clouds in search of a more favorable wind and, striking a crosswind, come out of them miles from his course. Instantly the thought arises: "Was my last check correct? Has the wind changed? Has my compass 'gone out'?" Sometimes he may discover his position, but usually he lands and asks a farmer where he is

Flying at 2,000 or 3,000 feet on a clear day and flying at a hundred feet under misting clouds offer the two extremes in finding one's way across the country by air. From 3,000 feet it is possible to see towns and prominent objects thirty miles away, and there is small chance of having trouble; but from a hundred feet, even in clear weather, the field of vision is cut to three or four miles.

Cross-country flying over nearly any part of the middle west is quite easy because of the abundance of towns and highways and systematically laid-out section lines, but there are some parts of the United States where a pilot can fly for as





Correcting an Airplane Compass on a Revolving Stand and, Inset, a Group of Airplane Instruments, Including Compass, Gasoline Gauge, Clock, and, Below It, Bank-and-Turn Indicators

much as two or three hours without seeing anything by which he can tell his whereabouts. It is then that the pilot becomes a navigator. Such areas show on the map as blank spaces, sometimes with a tiny line threading along where a stream is supposed to be, but often when the stream is reached it is nothing but a dry wash, inaccurately placed upon the map, and therefore useless as a check for locating one's position.

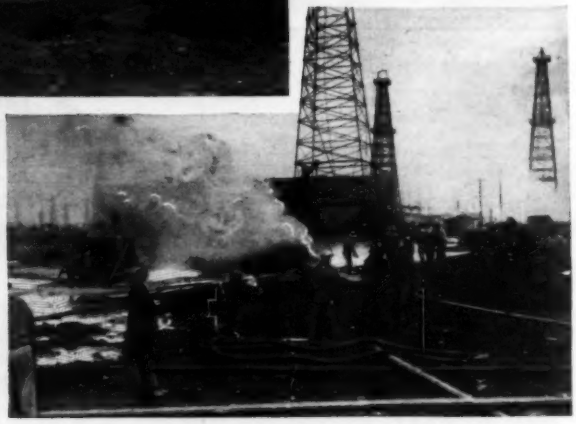
In flying over country of that kind, the initial check point is of the greatest importance, for only in that way is the pilot able to tell whether he is correct or in error in choosing his course. After leaving the flying field and passing the first check point, he must trust entirely to his compass. If he starts out in the proper direction and watches carefully for cross-winds, he will have no trouble in arriving at his destination, but if he is as much as five degrees or more in error, he will find himself, at the end of a two-hour flight, so far away from his correct route that he will have great difficulty in locating it. And if there happens to be no definite final check point he may "overshoot" and continue on, believing that a headwind has delayed him. So the final check is almost as important as the initial one.

HELIUM LEAKS THROUGH GLASS YEAR'S TEST SHOWS

Although glass is popularly considered as a fairly leak-proof material, helium gas seeps through it in small quantities after a time. Workers at Harvard university stored about a quart of it in a container of special glass and left it there a year. At the end of that time, about one per cent of the original contents had escaped by seepage, measurements showed, although the bottle was carefully sealed.

SNUFFER PUTS OUT OIL FIRE BURNING TWO MONTHS

After a battle of almost two months' duration, engineers finally succeeded in extinguishing an oil-well fire that had cost more than $1,000,000, in the California fields at Santa Fe Springs. An important aid to the final victory was an adaptation of the old-fashioned candle snuffer. In this case, it was a big steel cap which was applied with the aid of a derrick on wheels. Several lines of hose, charged with steam, mud and water, helped subdue the raging pillar of fire.



Huge Snuffer Built to Extinguish Blazing Oil Well, and a Scene at the Fire Before Cap Was Put On

WAR TANKS WRECK OLD PRISON TO SAVE HAND LABOR

Ten tanks engaged in a peace-time "battle" recently when they were directed against the walls of an old prison at Fort Lewis, Wash. The structure, about 100 feet square, was surrounded by two lines of barbed wire, but the tanks passed through these with little difficulty and soon reduced the prison to ruins. To make the attack seem more realistic, machine guns fired a volley as the tanks started.

WHEEL THAT WELDS SHOES SPEEDS PRODUCTION

Shoe soles and uppers are welded together instead of tacked, on a wheel apparatus now being used successfully in several American factories after its appearance in Germany. The machine has turned out as many as 900 pairs in a single day, and its essential function is to force the sole and upper together by compressed air. A special glue is employed, eliminating the need of tacks or thread. The wheel holds thirty pairs, that number being made at each revolution. Simplicity of operation, as well as a saving of time, commends the process to the manufacturer. More than 60,000,000 pairs have been made by this method in Germany.

TIRE CHANGED IN FEW SECONDS WITH IMPROVED TOOL

Tires on the model-A Ford can be changed in a few seconds and with little difficulty, it is said, by using a lever device now on the market. The wheel is laid flat on the floor or ground. In putting the tire on, the hooked end of the tool is placed around the tire and rim. A slight forward pressure on the leverage bar against the hub, permits the tire to slip on while the operator steps on the section not already in the rim. The tool will also pry the tire off.

Tire Tool for Fords; It Is Hooked over the Rim and Leverage Applied from the Hub

Popcorn in Thin Paper Cones Can Be Eaten without Soiling Fingers; Squeezing Bottom Forces Corn Up

PAPER CONES FOR POPCORN KEEP FINGERS CLEAN

Cones of transparent paper have been introduced for holding popcorn, to keep the fingers free from butter and to simplify eating. The cone is held in one hand and pinched slightly at the bottom to force the corn upward.

HOW TO BEAR UP IN A GALE.

How strong the wind must be to blow a person off his feet has been calculated by an English scientist, who found that in an eighty-mile-an-hour hurricane the wind pressure equaled thirty-two pounds to the square foot. A bulky person, presenting ten square feet of area to the wind, would have to stand up against a pressure of 320 pounds. In an average strong wind, blowing thirty miles an hour, the wind pressure is four and a half pounds to the square foot. In a forty-mile wind, it becomes eight pounds; at fifty miles, twelve and a half pounds, and at sixty miles eighteen. This gives some idea of the enormous pressure which often wrecks signs and plate-glass windows. In a sixty-mile gale a window only ten feet square is subjected to a pressure of 1,800 pounds.

Two Hours

© New York Stock Exchange

Page Telephoning Quotations from a Trading Post to the Quotation Room, New York Stock Exchange

AT 5:42 o'clock on a recent afternoon, the ticker service pounded out the last 700 shares of a 6,458,700-share day on the New York stock exchange—a sale that had occurred two hours and forty-two minutes before—and came to rest. Taking the estimate that the average price of all stocks traded in on the "big board" is $84, a $546,000,000 business had been done between 10:00 a. m. and 3:00 p. m., which explains why the overworked ticker bogged down and finished up nearly three hours after the bell rang as a signal to cease trading.

Anticipating just such a breakdown, inventors had already developed a new type of ticker that can write 900 characters instead of the 300 per minute on the machines which have been in use for many years, and the stock exchange had arranged to install them as fast as they could be turned out.

Invention and mechanics play a large part in the operation of the stock exchange. Without the telephone and the telegraph, a six-million-share day would be a physical impossibility, both because distant investors from all parts of the country could not be in instant touch with their New York brokers and because the brokerage offices themselves could not handle the sales.

Follow the route of a sale from the time the order is given until it is filled and the customer notified, and you find the biggest part of the work is being done by electricity. Take the case of a man in, let us say, Seattle, who wants to buy one hundred shares of U. S. Steel. In his local brokerage office a trans-lux machine is throwing the image of the ticker tape on a screen, so that every occupant of the room can see the latest sales quotations, telegraphed direct from the New York stock exchange just as they are made—that is, on days when the ticker has not fallen behind.

The customer watches Steel quotations, decides to buy, and writes out his order to buy "at the market." The blank is handed to a telegraph operator and the order dispatched by electricity over a private telegraph wire to the firm's New York office. There it is telephoned, again by electricity, to one of the firm's telephone men seated in one of the many booths that line the edge of the trading floor. The order taker presses an electric button and a number panel flaps down on a big call board high on the wall, signaling a floor trader that he is wanted at his telephone booth. He rushes over, gets

Getting the Market Report in a Broker's Office; at the Right Is the Board and in the Background the "Trans-Lux" Screen on Which the Moving Tape Is Reflected

the order, dashes out to the trading post at which U. S. Steel is listed and listens a moment for an offer to buy or sell, to get the market quotation. Some trader offers a block, the buyer with the hundred-share order nods or says, "Take it"; both buyer and seller note the deal on slips of paper—no written agreement is exchanged between them—and the deal is closed. The buyer notes his purchase and the price on a slip, hands it to a messenger to be telephoned back to the office, and his part is completed.

Again the telephone and telegraph are used, and within a matter of minutes after the order was written, the customer in far-away Seattle is informed he owns a hundred shares of Steel and the price he paid for it.

Before 2:00 o'clock of the following afternoon, the seller in New York will deliver the stock certificate to the broker representing the buyer, it will start westward, probably by air mail, and will be paid for on the coast.

That, in brief, is the history of every stock sale. If the buyer is in New York, the telegraphing will be eliminated, and if his order is for less than one hundred shares, instead of going to a floor trader it will be dispatched from the telephone booth by pneumatic tube to an "odd lot" broker at the trading post, but those are minor differences.

The business of the stock exchange is chiefly to provide a place for traders to congregate and make their deals, and a system of reporting all sales as promptly as possible so that not only the floor traders, but brokers and customers all over the country, can be kept informed of current quotations. The exchange also makes rules that govern the conduct of business and sees that every member lives up to his contracts.

Business opens at 10:00 each morning, when the chief reporter, in a lookout tower, taps a big brass gong, and continues without break until 3:00 p. m., when another boom of the gong suspends business for the day.

Between those hours the floor below is a bedlam in which nearly a thousand men move and shout. There are brokers who

buy and sell on commission for others. Dealers and traders who buy and sell for themselves. "Two-dollar brokers," the free lances of the floor, who got their name in the old days when $2 was their customary share of the $12.50 fee then paid as commission on the purchase or sale of each hundred shares of stock. Telegraph and telephone operators, reporters, pages, messenger boys and guards fill in the gaps. There are 1,100 telephone clerks alone, sitting in front of a total of 1,600 telephones. The clerks wear headsets, with transmitters strapped about their necks, like telephone operators, to leave both hands free for their work.

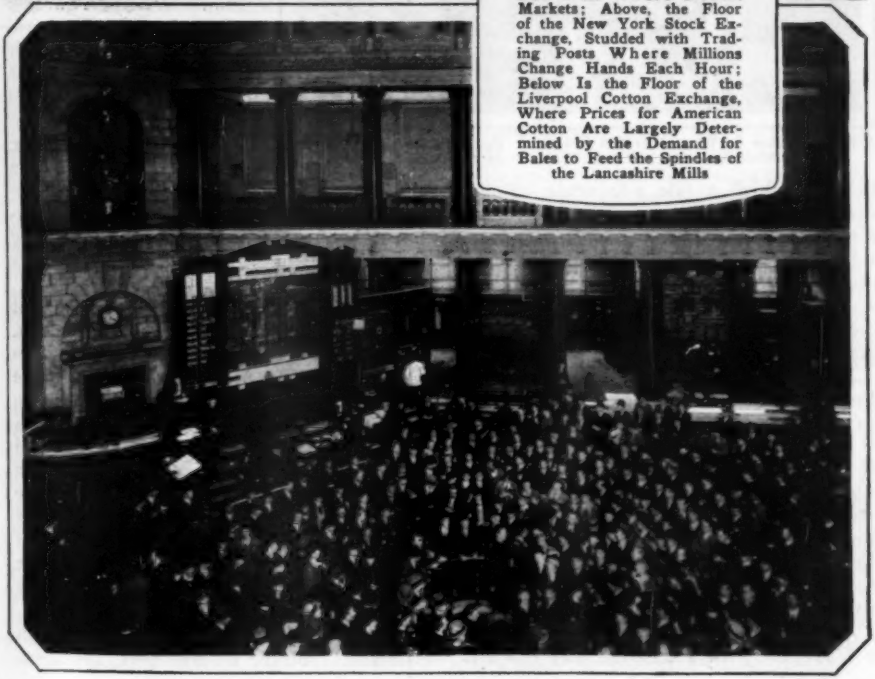
High on the wall at one end of the room are big black frames, twenty feet square—the annunciator call boards. When a clerk takes an order he presses a button, and a number plate, as big as an automobile license, flaps down and remains visible until the floor man assigned that number answers the call. Every one of the 1,100 members of the exchange has an individual call number.

The same day the market was handling nearly six and a half million shares, a "seat" on the exchange sold for $525,000. A seat is one in name only, for the holder is too busy to sit down from the time the opening bell rings until trading closes in the afternoon.

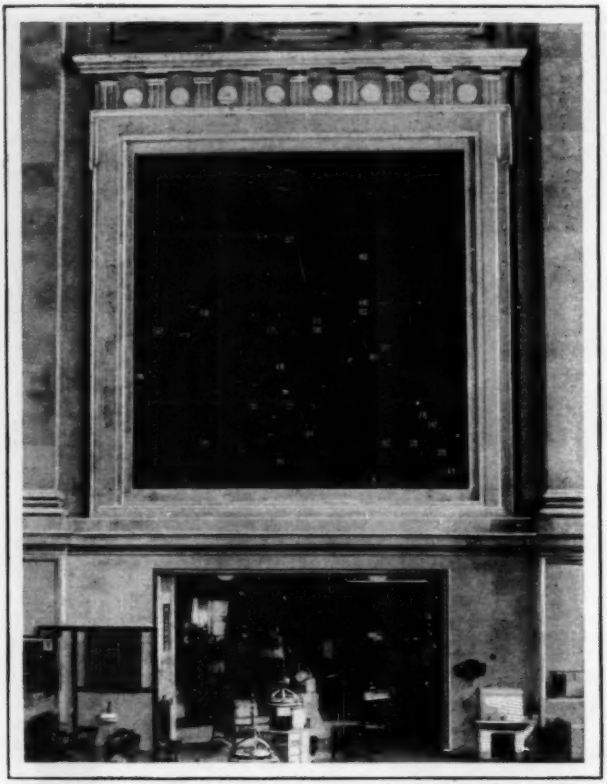
His business centers during the day about the twenty trading posts in the main room, the ten in an adjoining chamber, and the money desk, where offerings of money to lend on collateral security are received by the money clerk from the various banks. Here the brokers who desire to borrow money are accommodated.

Trans-Lux Screen and Ticker, Top, and a Stock Exchange Page Dispatching Orders through Pneumatic Tubes to Trading Posts

The trading posts themselves are circular booths some ten feet in height. Their upper portions have twelve faces, each decorated with a list of stocks, followed by movable figures to show the last



Two of the World's Greatest Markets; Above, the Floor of the New York Stock Exchange, Studded with Trading Posts Where Millions Change Hands Each Hour; Below Is the Floor of the Liverpool Cotton Exchange, Where Prices for American Cotton Are Largely Determined by the Demand for Bales to Feed the Spindles of the Lancashire Mills



When a Broker Is Wanted at His Telephone Booth to Receive an Order, His Number Appears on One of These Huge Annunciator Boards

price at which a sale was made. Below each stock there is a record of its movements for several weeks back. On one side of each post are pneumatic tubes for the so-called specialists—men who deal in some specific stock or stocks alone, and the odd-lot men, who handle sales of less than one hundred shares.

The ticker transmitters are out on the floor, with an operator at each to tap out, on a typewriterlike keyboard, the record of each sale as it is brought to him by one of the reporters. When sales start, the reporters are gathered around each post, ready to listen in on the trades made, note the stock, the number of shares sold and the price paid, and rush the slip to a ticker operator to be transmitted to every brokerage office in the country.

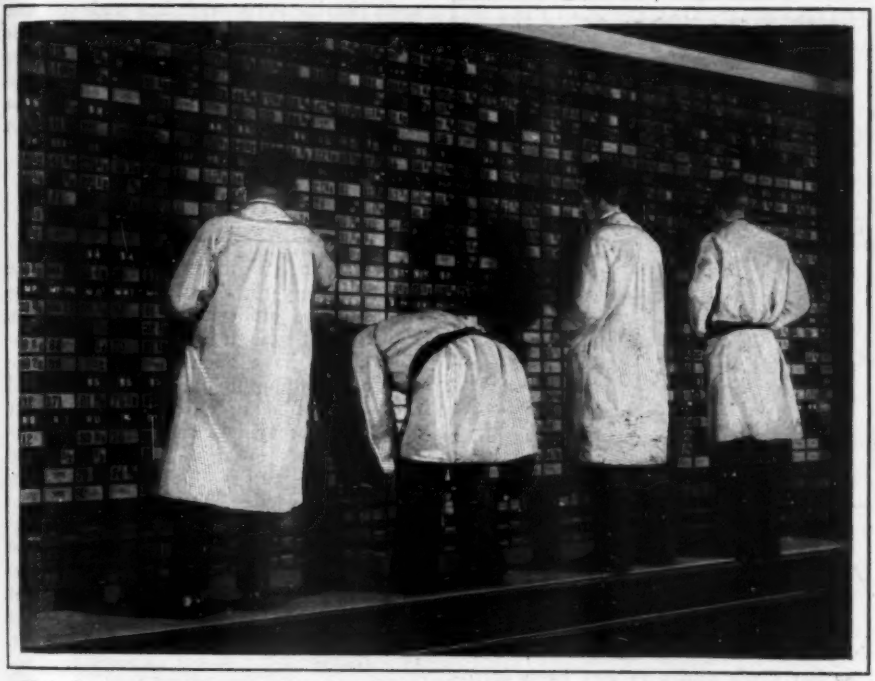
When sales passed the six-million mark in November, the exchange met the difficulty temporarily, until the new ticker equipment could be installed, by dropping the number of shares from the report, noting only the name of the stock and the price paid. A car load of special telegraph printers was rushed from Chicago to New York on the Twentieth Century limited and within a few hours lines had been rigged into every newspaper and press-association office in the city to carry the sales figures, so that newspaper tables could be compiled as usual.

The amazing thing about the stock exchange is that such a vast business can be conducted without the exchange of even a written memorandum. When a broker sells or buys in the morning at one price, and later in the day discovers a much larger profit could have been made or a loss averted by postponing the deal, there may be a desire to "welch," but such a thing is unknown. The exchange irons out differences between members, but, considering the vast business handled, differences are few and far between.

Normally, business is conducted almost entirely on the basis of the ticker reports, as brokerage offices and customers alike depend on them to show the state of the market. When the ticker falls an hour, two hours, or even more, behind, the sales orders to "buy at the market" are entered blindly, for the customer has no means of knowing what the market may be, or a "bear" movement may have started and forced it down far below the recorded price.

It is for this reason that a better ticker service has been so urgently needed.

The floor telephones alone carry an enormous volume of business, for more



Clerks Posting Quotations on the Board in a Broker's Office; from Ten to Three They Labor to Keep the Board Up with the Ticker, in Order That Customers May Have Latest Figures

than a million phone calls, it is estimated, are made on a busy day. Control of vast industrial empires may change in those five hours of activity, and thousands of people may be enriched or made poorer. Business has increased thirtyfold on the exchange since 1900. Fifteen million people, it is estimated, own stock in American industries, with an investment of something like $350,000,000,000.

And the whole business is sealed with a nod of the head or two words—"Take it."

The procedure on the stock market differs notably in at least one particular from that used on Chicago's famous Board of Trade, where the bulk of the nation's grain crops are handled. Under the stock-market rules, only oral sales can be made, whereas the grain traders of Chicago have a complicated system of finger signals to supplement their voices. The wheat or corn pit on a busy day is even more of a bedlam than a trading post of the stock exchange, with hordes of brokers shouting and waving their hands, alternately extending and closing their fingers as they indicate the prices at which they will buy or sell.

The grain pits get their name from their construction. Instead of a trading post, a huge circular pit is provided for each grain dealt in. The pit is formed by building up three steps from the main floor, and three down into the center pit, giving an amphitheater for the traders, who not only can fill the center, but, by standing on the surrounding steps, see over the heads of those below.

GEARLESS TWO-SPEED AUTO HAS VALVE CONTROL

A gearless motor for automobiles has been developed by a California inventor. Its basic principle is a controlled valve inclosed in an oil-filled cylinder. There are only two speeds with an unbroken range of power between the two. The speed at which the engine may run depends upon the degree of valve opening.

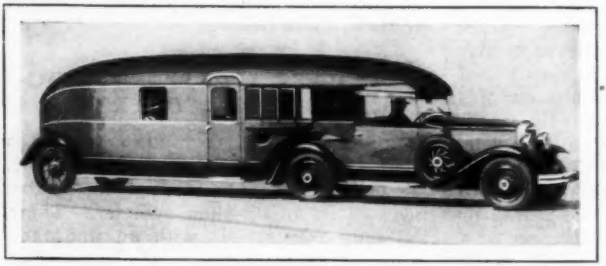
A Safe and Comfortable Auto Seat for the Baby; It Can Quickly Be Converted into a Crib

AUTO CHAIR AND CRIB IN ONE INSURE INFANT'S SAFETY

For the safety and comfort of a small child while riding in an automobile, a combination chair and crib has been introduced. It hangs over either side of the front seat and can be revolved in any direction desired. Parts that come in contact with the upholstery are covered with rubber to prevent damaging the fabric.

COMBINED BUS AND TRAILER DEVELOPS HIGH SPEED

For comfortable cross-country touring, a combination motor coach and trailer has been designed by Glenn Curtiss, pioneer aviator. He has incorporated lines of aircraft in its form and has reduced the weight below that of other vehicles of this size and capacity. The long wheelbase affords ease in riding, and the coach develops high speed. On a recent run from Florida to Detroit, it averaged more than forty miles an hour.



For Fast and Luxurious Travel by Motor Bus; the Combined Coach and Trailer Designed by Glenn Curtiss

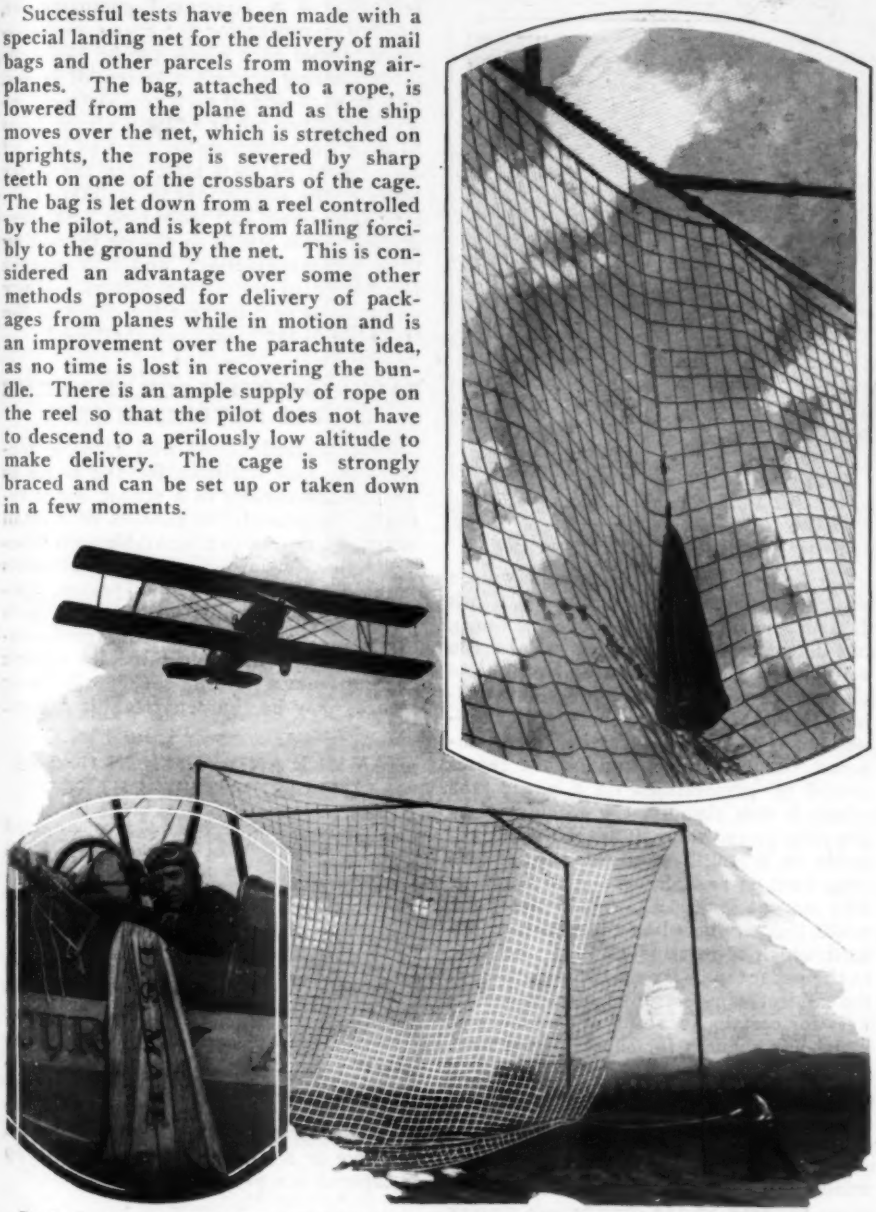
MEASURE OCEAN BY ECHOES FOR SAFER SHIPPING

How man is utilizing echoes to realize greater safety on the seas is one of the romances of modern scientific progress. For the first time in history, adequate marine charts have been prepared for Pacific coast shipping by this method, and the work is being extended over other areas where mariners need reliable guides to avoid the menace of hidden reefs and shoals. The plan is simple, in the light of modern knowledge, but would have been considered little short of miraculous just a few years ago. A sound is sent from the survey ship. It speeds to the bottom of the ocean at the rate of about 4,800 feet a second, for sound travels much more rapidly through water than through air. It bounces back. Sensitive recording apparatus registers the elapsed time between the sending of the sound and its receipt back at the ship in the form of an echo. The computation of the depth at that point, thus becomes a simple problem in mathematics. But the ship can do more than merely measure the depth. It also charts the location of the spot at which the sounding was made with respect to the shore, and this is exceedingly important to the mariner. Other important advantages of the method are that it can be carried on at night and in fogs, and is rapid and effective even at great depths.

¶The Popular Mechanics' Bureau of Information offers its free service to all readers of our magazine. Names and addresses of manufacturers and dealers in articles described, and any other details in our possession, will be promptly furnished.

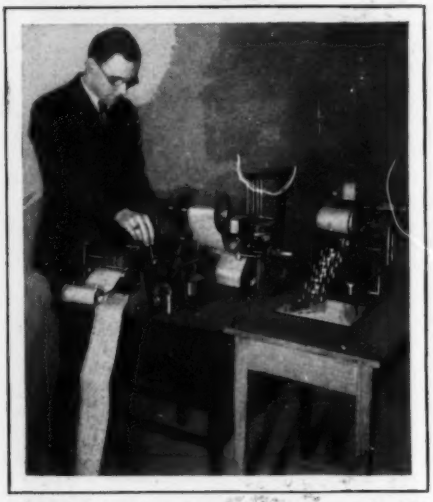
AIR MAIL DELIVERED ON FLY INTO NET WITH TEETH

Successful tests have been made with a special landing net for the delivery of mail bags and other parcels from moving airplanes. The bag, attached to a rope, is lowered from the plane and as the ship moves over the net, which is stretched on uprights, the rope is severed by sharp teeth on one of the crossbars of the cage. The bag is let down from a reel controlled by the pilot, and is kept from falling forcibly to the ground by the net. This is considered an advantage over some other methods proposed for delivery of packages from planes while in motion and is an improvement over the parachute idea, as no time is lost in recovering the bundle. There is an ample supply of rope on the reel so that the pilot does not have to descend to a perilously low altitude to make delivery. The cage is strongly braced and can be set up or taken down in a few moments.



Bag in Cage Showing Teeth That Cut the Rope; the Lowering Reel on Side of Fuselage near the Pilot and Net Ready for Catching a Bag from Approaching Plane; the Trap Can Be Set Up in Any Part of the Field and Is Taken Down or Assembled in a Few Moments; Side Arms Direct Rope against the Knife

MACHINE HELPS CHOOSE CAREER BY SHOWING TALENTS



Mechanism for Measuring a Person's Fitness for Different Careers; It Tabulates Results of Tests

To help a person determine his life's work according to his abilities, Dr. Clark L. Hull, of the University of Wisconsin, has devised a machine that correlates the results of various written and oral tests on the subject and summarizes the findings. Data from thirty or forty examinations as to the person's character, temperament and other qualities are represented by perforations on a paper tape which is run through the machine. As the strip passes along, it automatically records on a length of metal, the individual's bent as regards several of forty or fifty occupations. As the choices are made, they are noted by the machine on a card which is inserted at the same time as the paper tape. By examining the card, the subject can determine his natural fitness for certain lines of work or those in which his chances for success seem best.

BETTER LIGHTS FOR SUBMARINES TO REDUCE ACCIDENTS

Changes in the methods of lighting submarines to make them more easily seen when running on the surface, are among the recommendations to be made to the navy department by the submarine safety board. Other improvements include a new type of door designed to facilitate the isolation of a punctured compartment, better equipment for the crews, comprising a special boot which can be easily removed, diving helmets, a system of valves, one on each side of each compartment, to which a diver might quickly attach lines to give fresh supplies of air, and sets of lifting eyes or pads built into the outer walls of the submarines to facilitate raising. The board had more than 5,000 suggestions from which to choose in making their recommendations and also sought the advice of submarine officers. Many of the ideas sent in were the result of the tragedies of the "S-51" and the "S-4."

TALKING MOVIES FOR THE HOME LATEST ENTERTAINMENT

Synchronized sound and moving pictures are now available for the home as well as the theater in a simple outfit recently introduced. It consists of a small projector, geared to a turntable with tone-arm and electric pick-up which connects the sound from a radio loud speaker. Special films and records are provided each month for a fresh supply of entertainment. The unit is operated by electric current from a lighting socket. Films or records may be run separately if desired.

HAMMER AND WRENCH IN ONE SIMPLIFIES TIRE CHANGE

Hammer and socket wrench are combined in a useful tool for changing auto tires. It is made of forged steel, and the wrench side is furnished in a ratchet type, or with a hexagonal shank, for mounting interchangeable socket-wrench caps. The handle is marked to serve as a gasoline gauge and the tip is tapered for prying off rims.

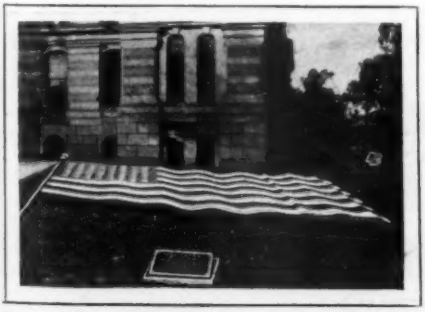
¶There are more dairy cows in India than in any other country.

ALUMINUM SUITS TO RESIST TEARING

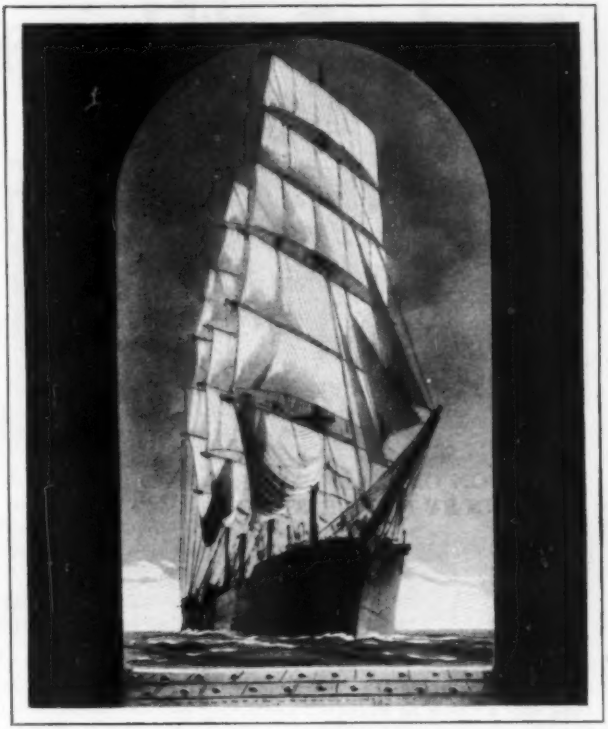
Clothing made of aluminum will be in vogue within the near future, a German metallurgist predicts. He points out that the material is already being used successfully to cover shoes, pocketbooks and vanity bags and is also being employed in the interior decoration of airplanes. The metal, in the form of thread, can be stretched through layers of cellulose superimposed upon it and subjected to pressure, and is not likely to tear or crumple, the expert declares. Considerable quantities of aluminum brocades, for women's garments, are being exported.

WAVING CONCRETE FLAG IS WAR MEMORIAL

Concrete has been used successfully as a substitute for fabric in fashioning a large replica of a United States flag for a war memorial at Quincy, Ill. The surface has been designed to give the appearance of being blown by the wind, while the stripes and field are colored in the true shades of the national emblem.



Concrete Flag as War Memorial at Quincy, Ill.; It Is in True Colors and Appears to Wave



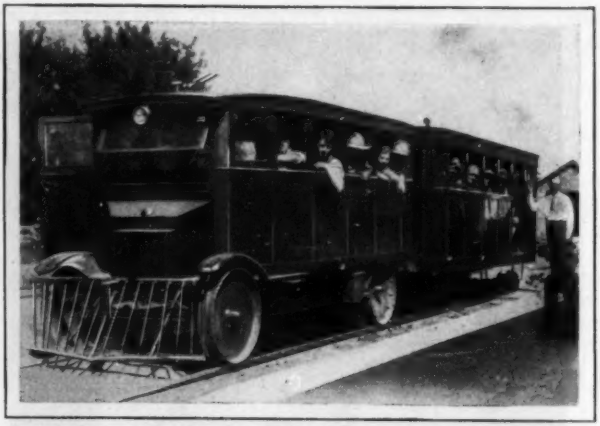
Photograph of the Four-Master "Parma," One of the Few Surviving Ships of Its Kind, Taken from Another Vessel

SAILING SHIP IS PICTURE QUEEN IN OCEAN TRAVEL

Although steam and motor vessels are far more efficient commercially than sailing ships, the latter still hold the popular appeal from the standpoint of majestic beauty. The accompanying photo of the four-master "Parma," was taken after its 100-day voyage from Hamburg to Chile.

DEEP-SEA WATER "IMPORTED" FOR AQUARIUM FISH

More than 100,000 gallons of sea water, pumped from the Atlantic far beyond the oil-contaminated area around New York city, was poured into the reservoir under Battery park recently for the aquarium specimens that thrive best in water free from pollution. A constant stream of fresh sea water flows from the reservoir to the tanks where the fish are kept.



Typical Train on the One-Man Railroad in Iowa; It Is Powered with a Small Automobile Engine

TRAIN ON ONE-MAN RAILROAD RUN BY AUTO ENGINE

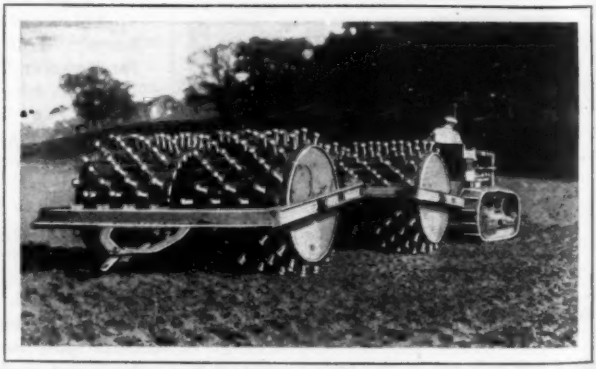
What is said to be the shortest railroad in the country is the eleven-mile line running between Tabor and Malvern, Iowa. It is owned and operated by one man, and the trains of special cars are powered with small automobile engines. These units are operated during the slack season. The road has a value of $135,000, according to the interstate commerce commission, and serves a farming district which, on account of its productivity, is known as the "Bread Basket of the World."

EXCAVATION WATCHER ON HUNT FOR RELICS OF PAST

Stealing a moment or two from work to watch excavators dig the foundations for big buildings, is the daily pleasure of thousands of city dwellers, but London has a man whose business is to do what others regard as an idle amusement. Wherever a building is being torn down or a new foundation being dug, he is on hand to find, if possible, relics of Roman days for the city museum. When such things are discovered, he endeavors to purchase the articles, but if the owners wish to keep them, he advises the finders as to their probable value and the best means for preserving them. Bits of precious metals, broken jugs, urns, coins, tiles and skulls are among the articles which the "champion building watcher" has found. Recently, excavators stumbled upon the remains of a medieval wine cellar. All but one of the jugs were broken and that was empty. The steam shovel and the pneumatic drill have increased the difficulty of the museum expert's task, for many relics are carried away or destroyed by these machines.

SHEEP-FOOT TAMPER ROLLERS PRESS SOIL FIRMLY

Fitted with extensions shaped like sheep's feet, a roller used for heavy work in California is said to tamp the soil more firmly than is possible with the usual style of roller. The feet help break up the clods and press more deeply into the ground than a flat surface will do. The rollers themselves are weighted with water and are emptied after the machine has done its work in a field, in order to facilitate transportation on roads and elsewhere.



Roller with Feet That Help Tamp the Soil and Break Up Clods; the Rollers Are Weighted with Water

Extra Special Hazardous

Jumping over One Automobile in Another Makes the Jumper a Poor Insurance Risk; No Accident Company Will Solicit His Business and, If He Asks for a Policy, Limits the Amount

"YOURS," says the insurance agent to whom the prohibition agent has applied for an accident policy, "is an extra-special hazardous occupation. Our company limits accident insurance policies on enforcement agents to a principal sum of $500 and weekly benefits of $2.50."

That, with a change in occupation and the insurance that may be written, is the answer a wide variety of people get when they seek an insurance agent and solicit a policy—for such occupations are never visited and asked to buy insurance.

Insurance, whether it is life, health or accident, ranges through a variety of risks from preferred, ordinary and medium, to the hazardous, special hazardous occupations, and so to the elite of dare-devils, who rank as extra-special hazardous.

Take the animal trainer who wrestles with the lion in the steel-barred cage of the mammoth shows. He's a poor insurance risk—"Ex. Spl. Haz.," the manual says. The dainty aerialist swinging from a trapeze overhead, along with all other circus performers and animal trainers, gets the same rating.

Out in the woods, the loggers, hewers, choppers and sawers are in the same class, and, at sea, submarine crews and common sailors on the surface share the rating.

Aviators are poor risks and must pay extra premiums to get even limited insurance. Most of the bigger companies have no such thing as prohibited risks in the accident department, insuring everything from flyers, through railroad freight brakemen and steel-construction workers to nitroglycerine makers and users—four of the world's most dangerous occupations. They even have rates for steeplejacks. Even city firemen and policemen riding motorcycles come in the extra-hazardous and special-hazardous classes, though neither ranks as Ex. Spl. Haz. Not all of the dare-devil occupations which are listed are things that thrill the public, acid makers, for example, or mining prospectors.

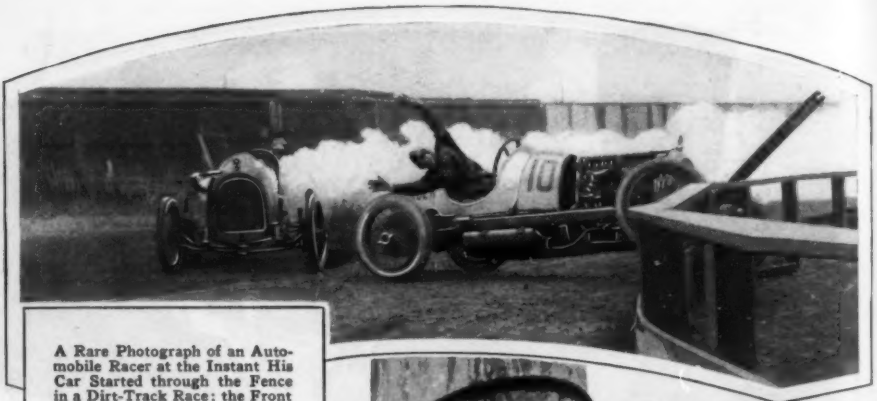
The Dainty Aerialist of the Circus, Swinging from Her Rings High in the Air, and the Lowly Canvasman on the Ground, Alike Are under the Insurance Ban, Because Their Work on the Lot and the Constant Traveling by Train Render Them Liable to Accident

Another Poor Risk Is the Motorcycle-Stunt Man and the Motorcycle Racer; Professional Athletes of All Sorts Are in the Hazardous-Occupation Class; at Left, an Easy Way to Get Injured or Killed Is Riding Outlaw Horses in a Rodeo; This Indian Was One of the Performers in the Fourteen Tribes' Ceremonies in N. Mex.

Photo, Ewing Galloway

The Man Who Paints Structural Steelwork Has to Be a Human Squirrel, and Is Entitled to His Place in the Gallery of Dare-Devils; at Right, Stubby Kruger, Who Quit as World's Back-Stroke Champion to Become a Professional and a Life Guard at a Long Beach, Calif., Pool, Demonstrates His Ability at Rescuing Fair Swimmers; Insurance Men Look Askance at Life Guards Because of Their Work. Their Small Number, Too, Makes Them Poor Risks, for Successful Insurance Depends Largely on Spreading the Risks over a Great Number of People in the Same Occupation

Jockey McKinney Caught in the Act of Acquiring a Broken Collar Bone in a Fall with His Mount "Mayflower" in the Oaklands Hunt Cup Race in Melbourne, Australia; Accidents and Riding Go Hand in Hand, and a Jockey's Life Is One of Constant Exposure to Crippling Injuries, If Not Fatal Accidents

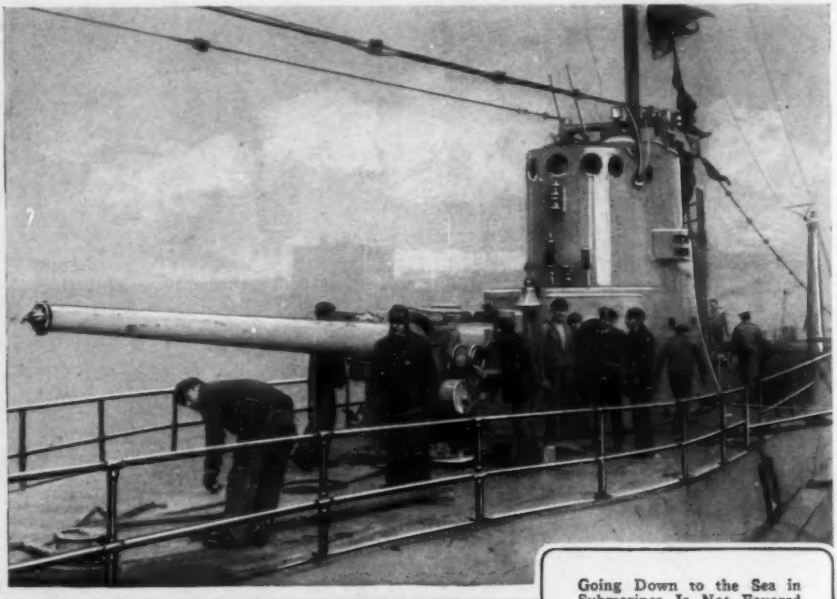


A Rare Photograph of an Automobile Racer at the Instant His Car Started through the Fence in a Dirt-Track Race; the Front Has Begun to Twist Over

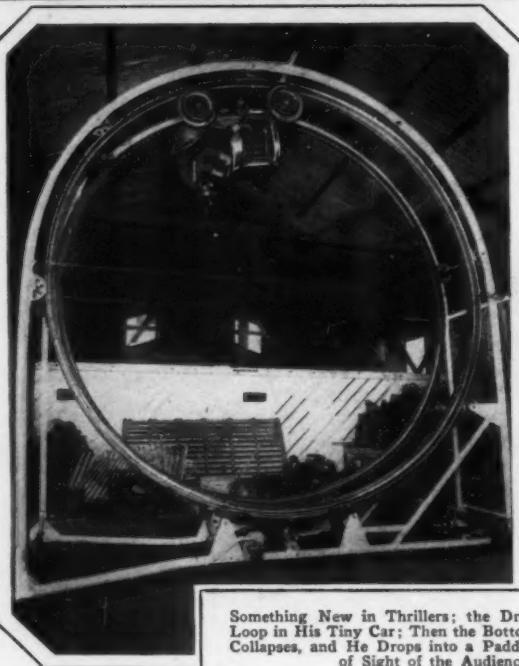
The "High Topper," Who Ties a Saw to His Foot, Passes a Rope around a Giant Douglas Fir, and Climbs 200 Feet in the Air to Cut Off the Top and Prepare the Bare Trunk as a Derrick Mast, Is a Real Dare-Devil; His Moment of Greatest Danger Comes When the Severed Tree Top Breaks Free, For a Back-Kick of the Huge Mass May Hurl Him off His Lofty Perch; Below, One of the Most Dangerous Jobs in Police Work Is Riding a Motorcycle or Sidecar, and the Men Who Are Assigned to Them Are Adjudged Poor Accident Risks; This Outfit Is One Used by the New York Police Department; the Sidecar Carries a Portable Radio Receiver, Tuned In on Police Headquarters, and the Armament Is a Thompson Submachine Gun, Capable of Firing 120 Shots a Minute

An Easy Way to Acquire Lily Wreaths Is to Become an Airplane-Stunt Performer; Miss Gladys Engle, Shown Above, Transferred from One Plane to Another, and Then, to Show Her Nerves Were Still Good, Hung by Her Heels from the Top Wing; Uncle Sam Has Forbidden Aerial Stunts over All Licensed Airports within the Jurisdiction of the Department of Commerce

Group of Chicago Speed Cops Practicing a New Stunt for the Police-Benefit Games; Team Work and a Steady Operator Are Essential

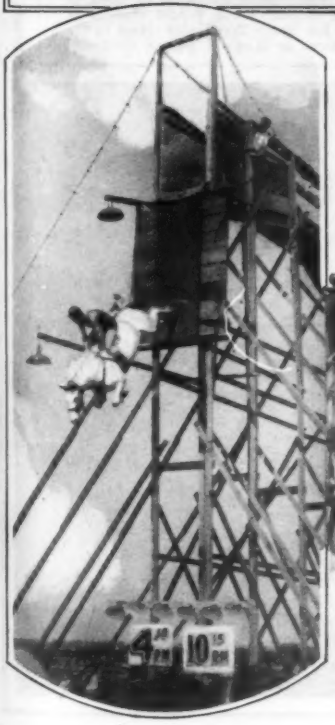


Going Down to the Sea in Submarines Is Not Favored by the Insurance Agent; Above, the Crew of the New "V-1," First of Uncle Sam's Largest-Type Fleet Submarines, Taking the Air on Deck after the Trial Trip; Below, Handling Dynamite and Other High Explosives, and Also Making Them Are Other Dare-Devil Occupations; These Men Are Stamping Dynamite for Identification



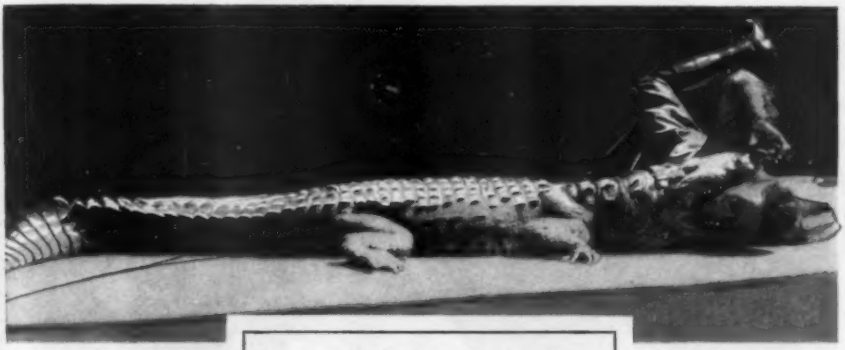
Something New in Thrillers; the Driver Loops the Loop in His Tiny Car; Then the Bottom of the Track Collapses, and He Drops into a Padded Basket, Out of Sight of the Audience

Capt. William Tucker, Deep-Sea Diver, Captured This Giant Octopus and Brought It Alive to Shore, to Be Exhibited with Himself; Perils of Deep-Sea Diving Suffice to Make Any Insurance Agent Shudder If He Is Asked to Underwrite the Diver's Life



The Girl Rider of the Diving Horse, Plunging from a Sixty-Foot Platform, Takes Her Life in Her Hands Twice Daily to Thrill the Spectators; Above, Ace Hudkins and a Sparring Partner, Wearing Padded Helmets to Cut Down the Risk of Injury during a Training Bout Preparatory to the Fight with Micky Walker; the Work of a Professional Boxer Exposes Him Constantly to the Chance of Injury or Death

What Happens When Man and Bicycle Leave the Track; the Rider Is Catapulted Upward, over a Net, and Drops into a Tank of Water in This Thriller; Below, Did You Ever See a Trainer Lie Down under a Couple of Tons of Elephant and Wonder What Would Happen If the Elephant Sat Down Too Hard? Here Is the Ringling Show in Madison Square Garden



El Guarany Demonstrates His Hypnotic Power over Alligators by Inserting His Head in the Monster's Jaws

Hanging from a Ladder Suspended between Two Towers 400 Feet above New York Streets, Sig Smith Performs a Few Feats

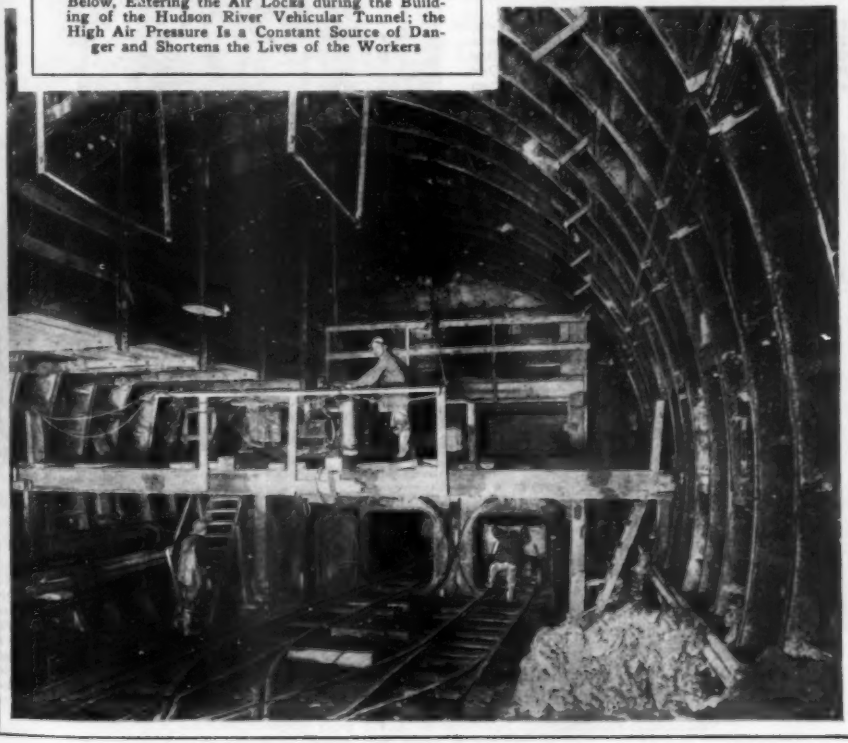
Fighting Fires Is a Dangerous Business, and Many Men Have Been Killed under Falling Walls; This Is a Paint-Factory Blaze

Buddy Mason Demonstrates His Bicycling Skill by Riding around the Cornice of a Twelve-Story Building in Los Angeles; All Movie-Stunt Men, and Even Stars Who Perform Their Own Stunts, Such as Fairbanks and Harold Lloyd Do, Are Listed in the "Extra-Special Hazardous" Class

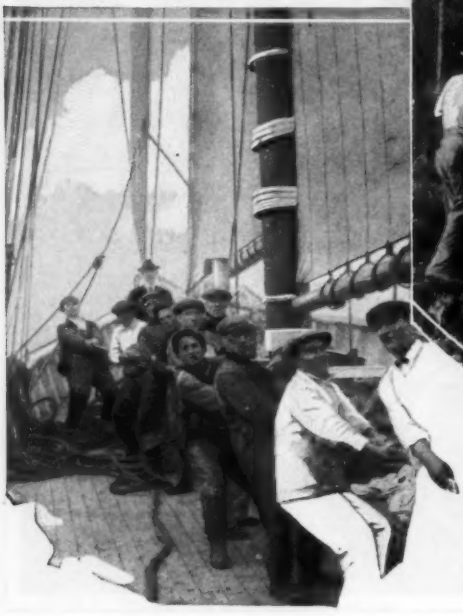
Pointing Up the Cracks in the World's Tallest Building; John Moore and Thomas Thom Were Snapped from a Tower Window of the Woolworth Building at Their Annual Task

Want to Wrestle with a Bengal Tiger, or a Human Opponent? Both These Jobs Are Classed as Too Exciting to Thrill an Insurance Agent; the Lady Above Wears a Leather Suit and Helmet to Protect Her against Accidental Scratches from Her Playmate's Claws, but If He Really Decided to Scratch in Earnest, They Would Be Poor Guards; the Gentleman at the Right with His Feet in the Air Is L. W. Muegge, About to Be Dropped by B. A. Shively as Part of the Practice Work of the Wrestling Team at the University of Illinois; Such Bone-Cracking Holds Do Not Put a Man in the Preferred List

"Cross-O Baldy," a Bad Horse from Montana, Attacking Bill Montgomery, a Canadian Rider, after Throwing Him; Beaten and Stepped On, the Rider Went to the Hospital; Tunnel Workers, Below, Entering the Air Locks during the Building of the Hudson River Vehicular Tunnel; the High Air Pressure Is a Constant Source of Danger and Shortens the Lives of the Workers



Prohibition-Enforcement Agents and Bootleggers, Too, Have Been Added to the Lists of Dangerous Occupations; Above, a Gunner's Mate of the Dry Navy Trying Out His Machine Gun aboard One of the Fast Patrol Boats Used to Drive Rum Runners off the Atlantic Coast



Loggers in the Woods Live a Dangerous Life, Not Only from the Perils of Handling Sharp-Edged Tools, but Also from the Kick-Back of Fallen Forest Giants; River Drives in the Spring and Log Rafting Also Are Classed as Hazardous Occupations; at Left, Sailors on the Nova Scotia Schooner "Bluenose" Hoisting Sail for a Race with the America's Cup Challenger; Sailors Are Poor Insurance Risks Because of the Dangers from Accidents and Storms

SOUNDPROOF ROOM DEVISED WITH NEW MATERIALS

How materials of recent manufacture are being applied to meet the needs of special tasks is well illustrated in radio broadcasting and the making of talking movies, where the construction of soundproof rooms is an essential. A building stuff, consisting chiefly of the refuse of sugar cane when all the sugar has been squeezed from it, has helped greatly in insulating the rooms, and engineers have devised special methods of construction to keep out sounds. For instance, to make a room practically proof against noise, it is built with walls of brick, four inches thick and covered on both sides with a hard cement plaster that tends to reflect sounds. The doors are of steel plates with an air space between them, and they are trussed to eliminate vibrations. A continuous air cell inside the masonry wall separates the inner room, which is suspended on wooden blocks and is lined with three or more layers of insulating material. These are glued on, as nails would make small openings and would also act as conductors for sound. Flexible electrical connections are used. The problem of ventilating such a room required special study, but was solved satisfactorily by equipping it with a system of ducts, arranged in labyrinth fashion and built on the same plan.

WHY WE WALK IN CIRCLES

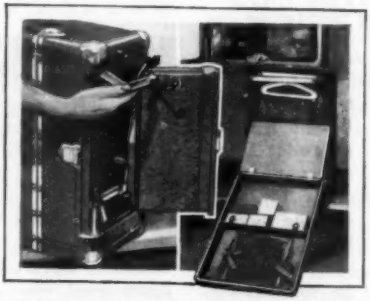
Persons lost or blindfolded naturally walk in circles or spirals, not because one leg is shorter than the other, but because of a special "steering mechanism" that takes control when the eyes are unable to function as directing agents. This is the opinion of a British professor who has been studying the movements of many different kinds of animals. He noticed the curving path made by a single-celled organism "swimming" in a glass of water, and concluded that this tendency is practically universal.

Combination Banjo and Ukulele, Which Is Really One Instrument; Interchange Is Made by Shifting Pick

BANJO AND UKULELE IN ONE PLAYED WITH FELT PICK

Banjo and ukulele are combined in a single instrument with one set of strings. To produce the banjo tones, the strings are struck with a felt pick, which is placed under the bridge to eliminate the banjo sound, when the instrument is to be played as a ukulele.

TRUNK ON AUTO RUNNING BOARD SAVES EXTRA LUGGAGE



Showing How Trunk Is Attached to the Running Board, and View of Roomy Interior

Quickly attached with self-contained clamps to the running board of any auto, a wardrobe trunk saves carrying extra baggage, holds many articles and is covered with a washable fabric. The trunk may be used as a separate piece of luggage, and brackets that secure it to the running board are easily concealed.

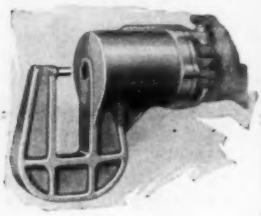
Setting the Electric Flasher Lantern, and a Close View Showing Battery Compartment and Lens

ELECTRIC FLASHER REPLACES SIGNAL LANTERN

As a substitute for the usual warning lantern that burns oil, a portable electric flashing beacon, supplied with current from batteries, has been introduced for construction work and all other places where warning lights are to be set at night. Economy, ease of operation, safety and dependability, as well as greater visibility, are a few of the advantages claimed for the unit. A year's upkeep expense is estimated at about ten dollars.

RIVETER FOR MOTOR CARS WEIGHS FIFTEEN POUNDS

Capable of exerting tremendous pressure but weighing only fifteen pounds, a portable riveter has been introduced. It is adapted especially for work on the bodies, hoods and instrument panels of automobiles, etc.



CHEMICAL COOLER FOR AUTOS

A chemical cooling system, working like a home refrigerating plant, has been developed by a Michigan inventor to take the place of water cooling for automobile and airplane motors. A thermostat control will hold the temperature within five degrees of the most efficient operating temperature for the engine. Sulphur dioxide, which absorbs heat five times as rapidly as water, is used as a refrigerant. A small pressure tank with pump carries the chemical supply under twenty-five to thirty pounds' pressure. When the engine reaches the desired temperature after starting, the thermostat admits small quantities of the refrigerant into coils surrounding the cylinders. The system is expected to prevent freezing troubles. The apparatus eliminates radiator, water and pump, and weighs about sixty pounds.

SCRAPER HAS HOOKED BLADE TO DO BETTER WORK

To scrape floors, remove paint, and perform other similar tasks, a scraper now on the market has hooked blades that can be removed and sharpened. The holder is shaped for comfortable and secure gripping, and, by varying the pressure and holding the tool at different angles, in accordance with the task, better results are obtained than with an ordinary instrument, it is asserted.

IMPROVED PUMP OF FEW PARTS INVENTED BY INVALID

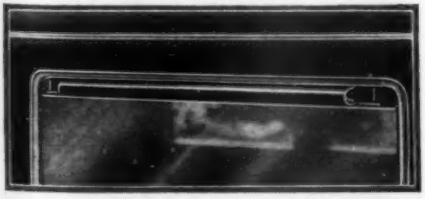
While confined to a hospital, a western man devised a pump which is said to be much simpler than types now in use. It employs a suction principle which the inventor developed while making experiments on a model flying machine. He utilized a two-hour rest period in the afternoons to work on his miniature pump and discovered that his first model operated successfully without alterations.

FOOD AND FUEL FROM COAL

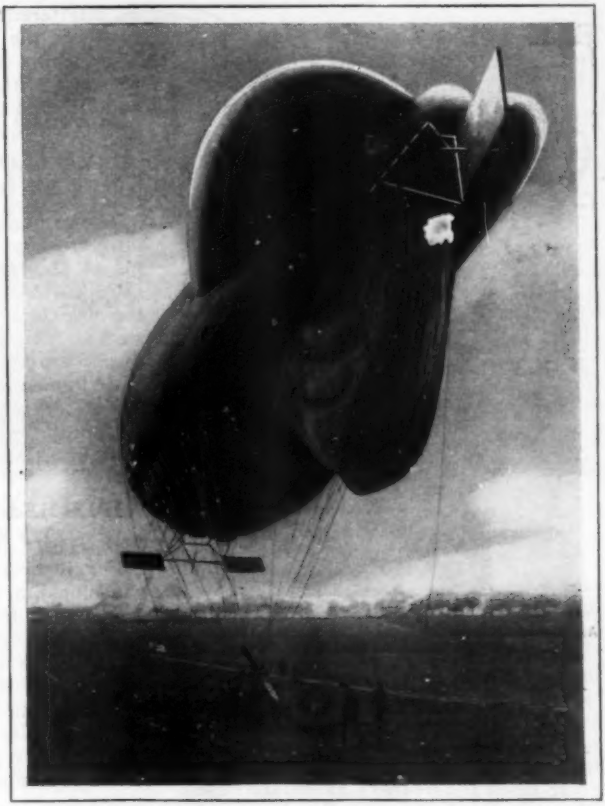
German chemists are obtaining soap fats, edible fatty foods, lubricating oils and an anti-knock motor fuel of high value from coal. Their results are of great importance to Germany, and of almost equal interest to the United States, for it has been revealed that various dye processes, controlled by the Standard Oil company in America, can be used effectively in the refining of crude oil. At one of the German plants an annual production of 70,000 tons of synthetic gasoline has been achieved, and by the end of this year, it is expected to reach 250,000 tons.

FORCE VENTILATOR FOR MOTOR CARS IS DRAFTLESS

Motion of the automobile draws air into a ventilator and out again so that the interior of the car is always supplied with healthful air without opening the windows and without a draft. The unit fits all models of closed cars and is installed without bolts, clamps or screws. It is said to be especially effective in drawing tobacco smoke from the inside of the car, and is a safeguard against any injurious fumes from heaters in the automobile.



Ventilator Attached to Car; the Auto's Forward Motion Draws Air Inside without Causing Drafts



With a Rudder at the Tail, Elevators Forward and an Outboard Motor and Propeller on the Basket, the Balloon Becomes a Dirigible

OBSERVATION BALLOON EASILY TURNED INTO DIRIGIBLE

An observation balloon of the sausage type developed during the world war, but which can be changed into a dirigible and navigate as an airship, has been produced by a German balloon factory. Stabilizing planes are fitted, and the power supplied by an outboard engine driving a propeller. The motor is attached to the basket swung beneath the gas bag.

¶The Popular Mechanics' Bureau of Information offers its free service to all readers of our magazine. Names and addresses of manufacturers and dealers in articles described, and any other details in our possession, will be promptly furnished by addressing the bureau.

As Wearer Raises His Hands at Bandit's Order, a Stream of Bullets Issues from Gun in Center

BULLET-PROOF VEST HAS GUN FIRED IN RAISING HANDS

Installed at the center of a special bullet-proof vest is a machine gun that starts firing when the wearer's hands are raised. The unit therefore gives offensive and defensive service, and is intended to be especially effective against holdup men.

TUNING FORK TO GUIDE PLANES FLYING THROUGH FOG

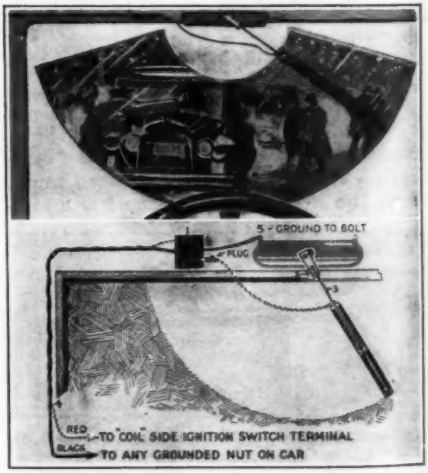
Another aid to safer flying was announced by the bureau of standards recently in the form of a tuning-fork device to guide planes at night and while passing through fogs. The unit consists chiefly of two vibrating reeds, mounted on the instrument board in a shock-proof case. Electromagnets, operating these reeds, are connected to the plane's radio set. When a beacon signal is received, the reeds vibrate. Since their tips are white, each produces a white line when moving and, if the lines are of equal length, the pilot knows he is on his course. The reeds are so adjusted as not to be affected by interference unless it is great enough to block the tubes in the receiving set. The use of a visible signal eliminates headphones and the constant annoyance of an audible code signal drumming in the ears.

LAVA FLOW FORMS RICH SOIL FOR GROWING GRAPES

The slopes of volcanoes afford the best vineyard lands the world knows, according to Dr. Henry S. Washington, of the Carnegie Institution, who gives that as the principal reason why inhabitants of such districts as surround Mt. Etna, where recent eruptions have occurred, cling to their homes in spite of the danger. The famous grape districts of northern France and southern Germany are in ancient volcanic areas which have long been inactive.

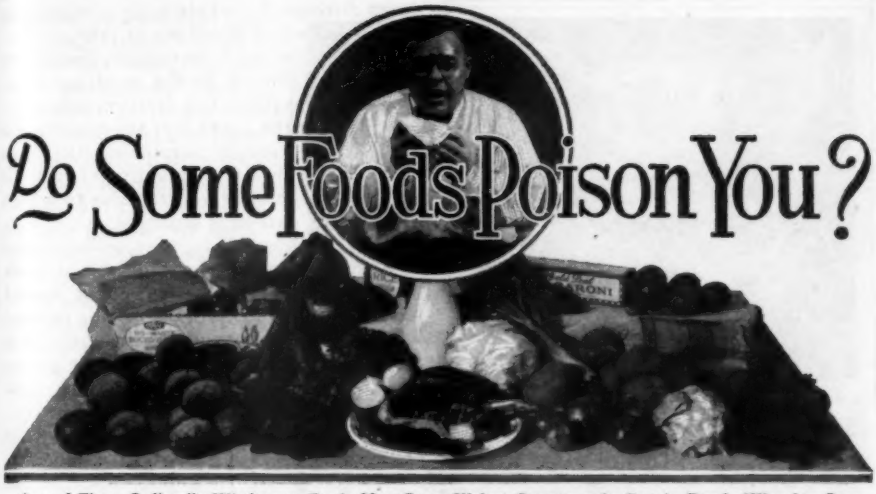
WIPER HEATS AUTO WINDSHIELD TO KEEP IT CLEAR

For installation inside or outside the windshield, a wiper is supplied with electric current from the ignition-switch terminal of the car and, by warming the glass, helps in the removal of sleet and mist. It is easily connected and, when not needed during the warm months, is quickly detached from the circuit. The current is automatically switched off whenever the motor is stopped.



Drawings to Illustrate the Effect of the Heated Windshield Wiper and the Method of Connecting It

Do Some Foods Poison You?



Any of These Ordinarily Wholesome Foods May Cause Violent Symptoms in Certain People Who Are Sensitive to Some of the Many Forms of Hay Fever and Asthma

By FREDERIC DAMRAU, M. D.

"SUPERSTITION!"

That is the remark that used to be made to the person who said that lobsters, bananas or some other food always made him sick, or that he became asthmatic whenever he went near a horse or a cat. But physicians now have found that such complaints explain the nature of many diseases which were not at that time understood.

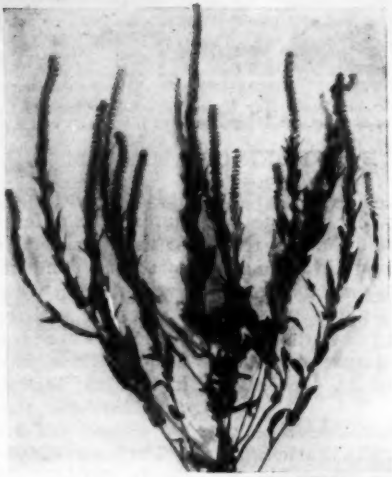
One of the most remarkable medical discoveries of recent years is that certain foods and inhaled particles, which are ordinarily harmless, may cause serious illness in the case of susceptible persons. One in every seven, it is now known, may inherit or acquire more or less sensitiveness to common articles of diet or substances carried in the air.

An attack of asthma may sometimes be precipitated by fondling a pet cat or taking a horseback ride. Many a person has been cured of severe asthma by the simple expedient of replacing the horse and buggy with an automobile, or getting rid of the cat. In such cases, it has been proved by skin tests that the patient is sensitive to horse or cat dandruff, as the case may be. The smallest amount inhaled into his lungs promptly produces the suffocating attacks, although it is entirely harmless to the average person.

Hay fever is another trouble of a similar nature, the difference being that it is due to the inhalation of plant pollens instead of animal dandruff. Many victims suffer every August with violent sneezing, nasal congestion and irritation of the eyes because they are sensitive to ragweed pollen. Other pollens, which may cause hay fever in different sections and at different seasons, include timothy, lamb's quarters, wormwood and many others.

The remarkable fact about the dandruffs causing asthma and the pollens causing hay fever is that they are entirely harmless when inhaled by most people. It is only when some one who is sensitive to the particular dandruff or pollen breathes it that symptoms follow.

This condition of specific sensitiveness is called "allergy," a term that is used whenever one suffers from the introduction of an ordinarily harmless substance into the body. For example, whether the symptoms follow an injection of diphtheria antitoxin, the inhalation of ragweed pollen or the eating of a banana, the term allergy may be used. All of these substances do not hurt the average person, but may be dangerous to those who are sensitive to them. And the substances which are capable of causing allergy in sensitive persons are called "allergens."



Hives, a very common trouble, can usually be traced to a condition of sensitiveness to one or more articles of diet; that is, to food allergy. I recall the case of a young woman, who was found to be sensitive to oatmeal, carrots and apples. When, without any medical treatment, she simply eliminated these articles from her diet, the relief seemed like magic. In some cases, especially in children, sensitiveness to some particular food, ordinarily not harmful, may be so extreme as to cause instant death. Dr. Von Starck, of Germany, relates the case of a boy who suffered from eczema after eating peas in any form. When peas were excluded from the diet, the eczema vanished. This experience certainly proves that what is food for one person may be poison to another.

Dr. Warren T. Vaughan, of Richmond, Va., recently reported twelve cases of migraine in which sensitiveness to certain foods played a part in causing the attacks. Unfortunately, different foods are responsible in individual cases and the same person may be sensitive to half a dozen or more substances. It is usually necessary to go through the whole scale of skin tests to find out which foods are at fault.

Perhaps the most marvelous feature of this whole subject is the accuracy with which the physician can perform skin tests and pick out the foods that are causing the trouble. By simply scratching the skin and rubbing in a tiny quantity of protein extract, it is possible to determine to which of them the patient is sensitive.

To be subjected to seventy-two skin scratches, as would be required if each of the proteins were tested singly, would be decidedly unpleasant. For this reason, various allergens have been grouped. For example, one group contains clam, oyster, crab, lobster, scallop and shrimp proteins; another, kidney-bean, lentil, lima-bean, navy-bean and pea proteins. If no hive forms after the group protein has been rubbed into the skin, it may be concluded that the patient is not sensitive to any of the members of this group.

Let us assume, however, that a large hive appears

Making Hay-Fever Tests to Find Out Which Pollen Is Responsible; One of the Pollen Producers, and, Bottom, Injecting Serum in a Guinea Pig

ten minutes after the shellfish group of proteins has been rubbed into the scratch. Then it is necessary to perform individual tests with clam, oyster, crab, lobster, scallop and shrimp allergens in order to determine which member or members of the group are the source of the trouble.

When the doctor has "spotted" the foods to which the patient is sensitive, his problem with regard to treatment begins. If the allergens should be unusual articles, such as almonds, garlic and tuna fish, all that is required is to forbid them. But suppose the skin tests should be positive to eggs, wheat or milk? These are staple foods which cannot very well be taken away.

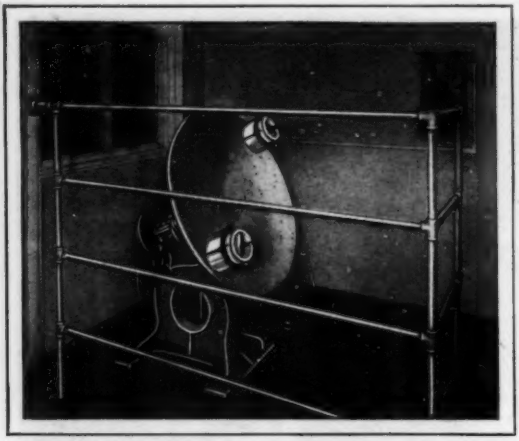
If a food cannot be eliminated, the patient must be desensitized to it. This is another marvel of medical science. It is brought about by injecting or feeding the very protein substance that causes the harm, but in such a very small dose that there is no reaction at all. These injections, or feedings, are repeated again and again in gradually increasing doses, until finally it is possible to give much more than would originally have produced violent symptoms. Then desensitization is complete, and the patient may eat eggs, or whatever the allergen happens to be, as freely as anyone else.

Some Children Are Sensitive to Dog or Cat Dandruff and Suffer from Asthma Until the Cause Is Found and Pets Banished

Experiments on guinea pigs help us to understand the nature of allergy, or protein sensitiveness. Let us take two of these animals and inject only one of them with a small amount of horse serum. Ten days later, let us repeat the injection, this time giving it to both animals. The guinea pig receiving the serum for the first time will not be affected. But the other animal will soon show signs of uneasiness, gasp for breath, go into convulsions, and die with its lungs inflated like a pair of bellows. In fact, a very much smaller dose of horse serum would have produced the same result.

What has happened? Briefly this: The first injection of horse serum, a substance foreign to the guinea pig, has caused a very remarkable change in all the cells of the little animal's body. It has set them to manufacturing millions of little chemical substances, called "antibodies," whose sole duty is to rid the body of the obnoxious horse serum.

What occurs when the second dose of horse serum is given ten days later? It is immediately met and destroyed by the flood of antibodies. But this destruction is fraught with dangerous results. The proteins in the horse serum are very complex chemical substances. When they are



Curious Revolving Machine Used in Manufacture of Pollen Extracts at a Detroit Hay-Fever Laboratory

broken down, various poisonous compounds may be formed. That is just what occurs in the guinea pig receiving the second injection. The antibodies are so numerous and powerful that they tear the protein molecules of the horse serum apart, as it were, and in doing so flood the body with poisons coming from these broken-down molecules. And these poisons instantly kill the poor little guinea pig.

Man as well as the guinea pig may show unfavorable symptoms after injections of horse serum, but they are always milder and seldom produce death. This is what sometimes occurs when diphtheria antitoxin is given to persons who are sensitive to horse serum, because this substance forms the basis of antitoxin.

Horse serum is but one substance of a class. Very many proteins, which are so plentiful in almost all of our foods, may act as allergens and produce violent symptoms in sensitive persons. Man is not so fragile as the guinea pig and does not succumb to the chemical explosion resulting when he eats a food to which he is sensitive; but what takes place in his body is probably much the same, differing only in degree.

The complete outfits of protein extracts now available enable the physician to determine which food, pollen or animal dandruff is responsible in a given case of allergy; to protect the patient from further symptoms by asking him to avoid these proteins, if possible, and to desensitize him to the harmful proteins, if necessary.

DIAMOND FIND IN INDIANA TRACED TO CANADA

That a diamond field may exist in Canada is the belief held by geologists following the discovery of several diamonds of commercial size in Morgan county, Indiana, about fifty miles south of Indianapolis. The diamonds were discovered by vacationists who were panning for gold in small streams that flow through the lateral and terminal moraines where three separate glaciers dropped their debris. All three, moving southward in the glacial age, are supposed to have originated somewhere in the territory between James bay, and a line drawn northward from Lake Michigan. The fixing of the probable western boundary is based on the fact that copper nuggets have been found near Danville, Ill., a few miles west of the Indiana-Illinois state line, and, as the copper must have come from the Lake Superior region, the glaciers which covered Indiana apparently originated farther east. Microscopic diamonds have been found in the township of Rheaume, northern Ontario, but their source has not been located.

AUTO JACK FOR SPRING REPAIRS HELPS STRAIGHTEN FRAMES

Replacement of shackle bolts at both ends of front and rear auto springs is simplified with an improved jack that also has several other uses. It may be employed with a section of tubing or pipe to spread or straighten frames, as a vise for holding spring leaves and as a tool for pressing in bushings.

Photographing the Players' Faces in a Movie Poker Game; the Camera Turntable Was Operated by a Long Arm Extending over the Actors' Heads, and the Camera Was Motor-Driven

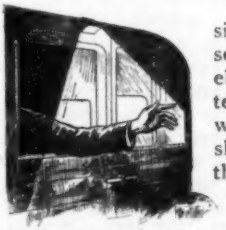
MOVIE "MERRY-GO-ROUND" FILMS CARD GAME

In a recent movie film a panorama was shown of the faces of the six card players. To obtain it, the camera was mounted on a revolving "merry-go-round" arm, the base of which was glued to the center of the game table. A long wooden arm, extending over the heads of the players, made it possible to move the camera and also served as a support for the wire supplying current to the camera motor.

WATER SHIELD FOR HOUSES TO FOIL GAS ATTACK

To protect persons from poison-gas raids during a war, a French expert has suggested a plan for covering houses by a shield of water, released from pipes on the roof. The blanket, he asserts, would neutralize the effects of the gas and so spare the occupants of the buildings. Objections have been offered to the scheme on the basis of its expense and because of the fact that many houses would have to be remodeled. Another student of the problem has recommended the enlargement of underground railroad stations to serve as gas-proof refuges.

AUTO LIGHT FOR HAND SIGNAL GUARDS NIGHT DRIVING



So that the hand signals can be easily seen at night, a small electric light is fastened above the door, where its rays will shine directly upon the driver's arm when extended. It does not interfere with the operator and also has two colored lights, one green and one red, at the front and rear respectively.

ADD NEW BEAUTY TO BURNED EARTH OF ANCIENTS

Model of Terra-Cotta Building, Showing the Shaded Effect of Different Colors; Preparing Clay Model for Large Piece, and Spraying Three Colors at Once

Terra cotta or "burned earth," is one of the oldest building materials known, but modern demands for novel color effects and for production in increased quantities have changed the methods of manufacture until the process has little in common with that practiced centuries ago. A spray gun that applies three different colors at one time, to produce the interesting "spatter" and other effects on the blocks, is used at a manufacturing plant near Chicago. The unit is like other sprayers of its kind except that it has three nozzles and three supply lines, each flowing with a liquid of a different color. The nozzles are alternately opened and shut off by means of an electrically operated set of stoppers. This saves separate applications of color and affords a wide variety of finishes. The color materials are applied before the terra-cotta blocks are burned. The burning process has also been greatly improved in recent times. A tunnel kiln, heated by gas or by oil burners, is used in several large plants, the terra cotta being slowly drawn through it on small cars. The burning takes a week or so by this method, whereas from two to three weeks are allowed in the usual kiln. A powerful press, operated by compressed air, to force the clay into the molds and special reflectors for the lights used in inspecting the blocks are other modern developments in the craft. The reflectors make it easier to discover defects present in the blocks.

DEPOSIT MONEY FROM AUTOS IN CHUTE OUTSIDE BANK

Patrons of an Oakland, Calif., bank may deposit money without leaving their cars. They drive up to a lock box at the curb, and slip their deposit through a chute. The plan is expected to relieve congestion and be of great service after hours.

AVERAGE ONE-FAMILY HOUSE COSTS FIVE THOUSAND

Interesting figures show that the average cost of houses is higher in cities of 500,000 population and over than in smaller centers, and that there is a considerable difference in construction costs in different cities, greater in some instances than the average citizen would suppose. In fourteen cities of more than half a million, the average cost of one-family dwellings was $5,169 during the first half of 1928. Such houses, however, were built for an average cost of $3,619 in St. Louis, while the same general type of dwelling cost, on an average, $8,534 in Washington, D. C., a difference of more than 100 per cent. It was not determined whether this increase was due to better houses in Washington or to higher construction costs or both. Multi-family dwellings in the fourteen cities averaged $4,214 per family. In twenty-two cities surveyed, less than half of the population were housed in one-family dwellings. In the smaller cities, those having a population of 200,000 to 500,000, the average cost per family of the one-family dwelling was $4,601. The costs listed did not include the cost of the land.

VERTICAL MILLING HEAD FITS ALL TYPES OF MACHINES

To save time and costs on various tool-making operations, a high-speed vertical milling-machine head has been introduced for use on all types of these machines without the need of bolts, clamps or other fixtures. A special feature of the device is that one or more units may be set up, as production demands dictate. The head is easily handled and may be hung on a wall when not in use.

¶Write our Bureau of Information, if you wish to know who makes or sells any article described in this magazine. Send no postage; the service is free.

Removing Ice Cubes from the Tray That Freezes Them in an Ordinary Refrigerator

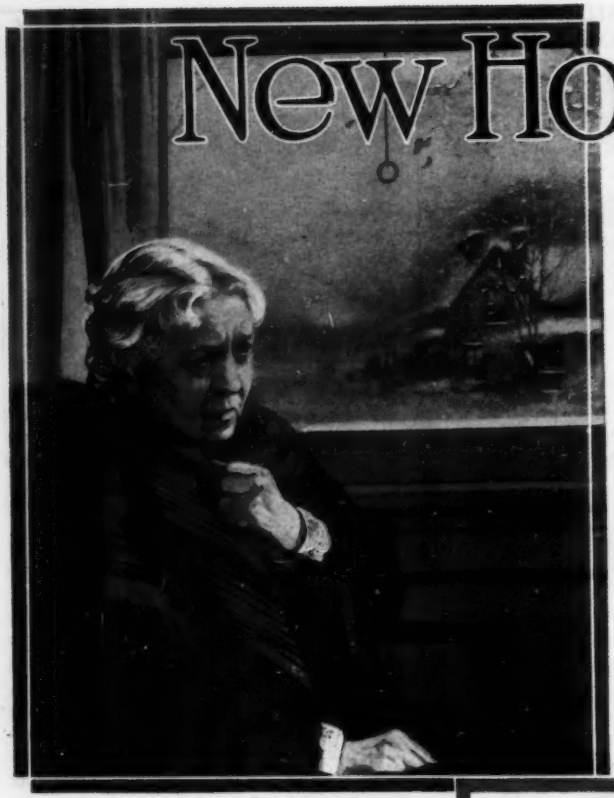
ICE CUBES FORMED IN TRAY OF SPECIAL METAL

Ice cubes can be made in refrigerators that are not electrically or chemically operated, with the aid of a mold which resembles a muffin pan and is made of a special alloy. It has twelve compartments and is simply laid on the block of ice, upside down, and in two hours or so, it melts its way down into the block until the upturned bottom is on a level with the surface of the ice. The cubes are formed in the compartments of the tray and are easily removed with the aid of an icepick or other tool.

SPARK-PLUG CONTACT MAKES CHANGES EASY

Doing away with the nut usually employed to fasten the cable terminal to a spark plug, an English device is claimed to cut down roadside and repair delays to the minimum. The nut is replaced by a spring connector, between the coils of which the end of the cable wire is held. Pressure on the sides of the connector frees or grips the wire.

New Homes



Think that over if you own an old house. The chances are you do, because Walter Kohler, head of the national home-modernizing bureau, says, "more than 16,000,000 houses in the United States are out of style."

It seems incredible that every other house in all the land is out of date. Yet those are the figures. You know the kind of house I mean. Built for shelter but with no special attention paid to style or beauty. Small cut-up rooms, windows badly placed, no weather stripping, no insulation, sinks too low, splintery floors, paint in bad repair, bathroom out of date—perhaps no bathroom at all. And a long list of other aches and pains. Houses that are literally "homesick."

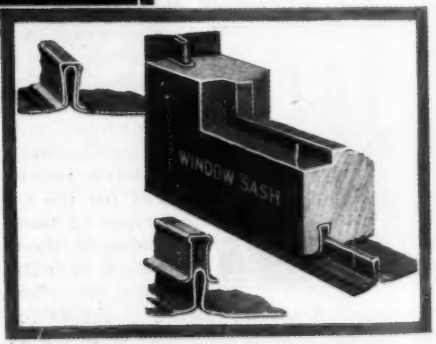
Hardly more attractive than a packing box to start with, the Nelson house survived a major home-modernizing opera-

By MAURICE I. FLAGG

A LITTLE money wisely spent in bringing an old house up to date can pay larger dividends than the same amount of money invested in gold securities.

If that sounds like a get-rich-quick proposition and glitters like a gold-brick promise, then read how the Nelsons spent $2,500 to convert the old house shown on page 239—hardly more than a shack to start with—into the charming modern small Colonial home at the bottom of the page and made more than 100 per cent on their investment.

According to appraisers, modernizing this down-and-outer increased the value from $600 to $6,000. What is more, the owners say the house can now be rented furnished for a sum large enough to pay off the cost of the entire job in a comparatively short time.



Adequate Weather Stripping, When the Old House Is Rebuilt, Can Eliminate Drafts; This Is a Metal Strip

From Old

tion. It is a splendid example of how the imagination and skill of a trained designer, when applied to even an almost hopeless case, can bring it back to life with all the charm and fine qualities of a spick-and-span dwelling, modern inside and out.

Timbers were structurally sound. The framework or backbone of the old house was in good shape. A remodeling plan was drawn by an architect. The following changes were made in the old house:

A basement was put in to accommodate a modern heating plant. But notice how cleverly it has been camouflaged. You are not aware of it at all. Why? Because in this type of house it is best to preserve that low-down close-to-the-ground appearance. Somehow you feel this house grows out of the landscape. There's a snuggle-up, homey, intimate quality about cottages that do not show too much of their basement walls.

The roof was next raised to provide two gables. Four feet were added to the living room. This gave the necessary space for the recessed front porch. New wood trim and new floors were installed. A bedroom and breakfast nook were added. That's about all the story except to tell you of the construction.

Cedar shakes laid with copper nails were used for the side walls and roof. Shakes are becoming popular as exterior wall coverings. They are modern shingles, patterned after the early hand-hewn Colonial shingles. Split toward the center of the tree, the crude early

Courtesy Weatherbest

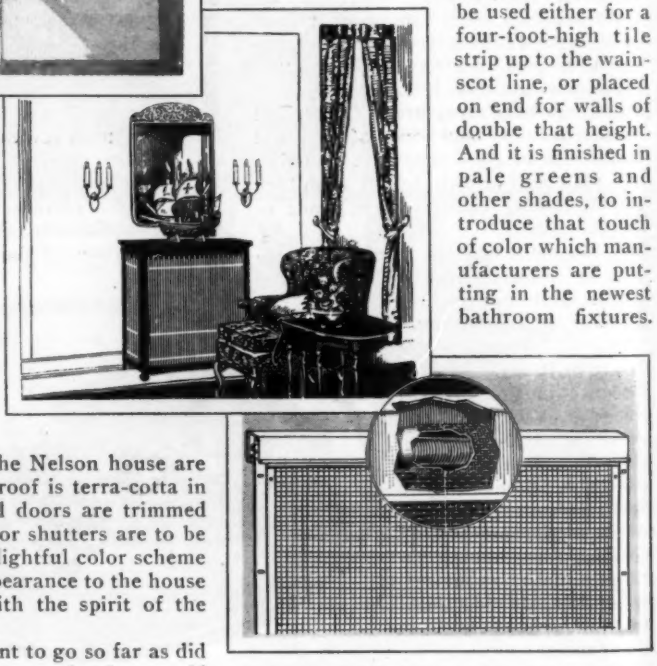
Before and After; a Typical Example of What Can Be Done in Rebuilding Even an Old Shack by Adding a Porch and Dressing Up the Exterior with Stained Shingles

shingles, or shakes as they were called, had thick butts. Shakes gave enduring service and the thick butts cast shadows producing light and shade textures to roofs and side walls. Architects desire the same qualities in modern designs.

The side walls of the Nelson house are stained cream. The roof is terra-cotta in color. Windows and doors are trimmed green. Green blinds or shutters are to be added soon. This delightful color scheme adds a fresh, crisp appearance to the house and is in keeping with the spirit of the modernizing plan.

Few people will want to go so far as did the Nelsons in order to modernize an old house. Generally, small additions and minor alterations work wonders in giving new life to an old house. A new sun porch, new dormers, new entrance door, new floors, a new bathroom, new side-wall covering of stucco, shingles or siding, new roofing, a fresh paint job, constitute the average improvements to an old house. Individually and collectively, such changes are not expensive. And you need not move out of the house while the work is under way. A job like the Nelson house might require living elsewhere during the process of ripping, slashing and moving partitions.

Even when a major operation is not performed, there are many little things that can be done to make an old house more attractive and more livable. An old bathroom with plaster walls can be brightened up and made the equal of the best of modern baths by covering the walls with tile or one of the tile substitutes that come in the form of wallboard. There is a tile panelboard on the market which comes in sheets of four by eight feet, so that it can be used either for a four-foot-high tile strip up to the wainscot line, or placed on end for walls of double that height. And it is finished in pale greens and other shades, to introduce that touch of color which manufacturers are putting in the newest bathroom fixtures.



Metal Plate, Flush with Wall, Covers Pipes and Can Be Papered Over or Painted; Center, Modern Radiator Covers Save Walls and, Bottom, Roller Screens End a Source of Trouble

The same panel tile boards can be used to brighten up the kitchen. They look and feel like tiles, and are washable.

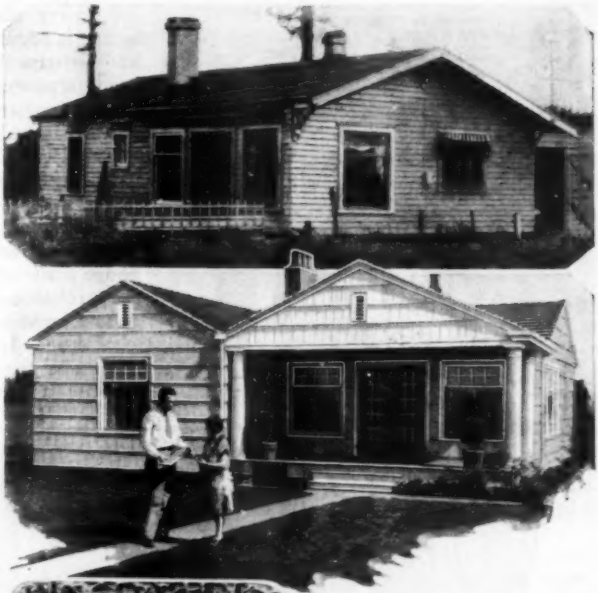
Wallboards have a multitude of uses in remodeling an old house. With them, it is easy to create an additional room or two in the attic, or convert part of the basement into an attractive playroom. Decorated with the plastic wall finishes, a wallboarded room is the equal, if not superior, to the best of painted or papered plaster.

One of the newest boards, made by a process recently imported from France, is an asbestos product grained to imitate wood. The imitation is so good, and the molding, of special designs, imitation carvings and molding strips so excellent, that it is being used for fine paneled libraries and dining rooms.

A visit to a building exhibition, where the manufacturers display all their newest products, is a revelation in what can be done to make an old house better. There are metal radiator covers, worth their cost for the protection they afford to wall finishes or paper, and equipped with concealed humidifiers which not only keep the air properly moist to ward off colds, but protect furniture and woodwork from drying out and cracking.

There are window screens which roll up like shades, and are left permanently installed, instead of being taken down each fall and put up in the spring. The screens are of lasting copper.

There are bathroom cabinets, fitted with Venetian-mirror doors, which can be installed in place of an old-type cabinet with wooden door and frame, or fitted between the studs in a bathroom which has had no cabinet.



It Cost $801.49 to Remodel This Old House, and the Valuation Was Increased by $3,700; at Left, New Wall Tile Which Comes in Four-by-Eight-Foot Sheets, and Especially Suitable for the Bathroom or Kitchen

There are all kinds of weather stripping, wood, fabric and metal, to keep out the drafts around shrunken and badly fitted doors and windows.

There is a new casement window which not only opens on hinges, but slides up and down like an ordinary window. It gives a wide range of ventilation, makes it possible to draw the curtains at night and still have fresh air, which can't be done with an ordinary casement, and solves the washing problem, as both sides can be cleaned from the interior of the house.

And for the modernized kitchen, there are sinks with built-in dishwashers, low sinks at which the housewife can sit while she washes the dishes, and a wide range of enameled metal kitchen furniture in standardized units, so that any desired arrangement of space can be assembled.

What about modernizing costs? That is a difficult question to answer. No two jobs are alike. Location and choice of

materials enter into final costs. For example, a new sun porch on an average small house may run between $600 and $1,000. Insulation for the attic roof between $75 and $100. Dealers everywhere can give approximate cost information almost instantly.

There has never been a time when money could be obtained more easily for home modernizing than now. Loan associations everywhere are co-operating with building-material manufacturers and with others, to make it easy for anyone to dress up the old house. I am told that millions of dollars are awaiting owners to use for home improvements. These dollars can be had almost for the asking.

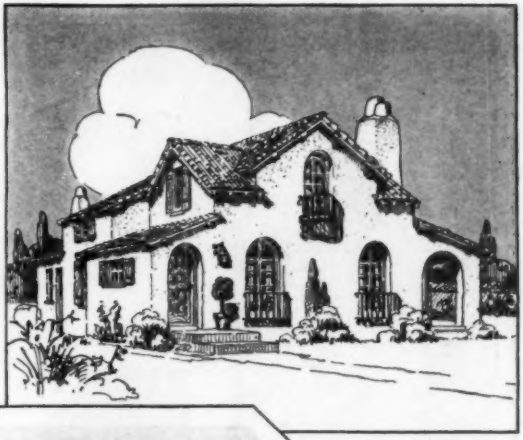
Frequently all you need to show for a loan is title to your property. Often the increased value of the house due to contemplated improvements is sufficient security for a loan. There is really no need for worry about money, provided your house is located in a good neighborhood and structurally sound. You can pay off home-modernizing loans on the easy-payment plan, and the rates of interest are quite reasonable.

Experienced builders say that your remodeling estimates should not exceed fifty per cent of the total cost of a new house offering you the same equipment and accommodations that you demand of the old house made over. Be sure to investigate the probable increase in value. It is a good plan to talk over all these points with local money lenders and tradesmen before you make your decision.

From a practical point of view, it is best to have your house inspected by an expert before you even contemplate spending a penny. Give it a fine-tooth combing. Investigate the condition of the footings, the framing, bracing, side walls and all exposed construction. Be sure it is sound and actually deserves rehabilitation.

Venetian-Mirror-Front Medicine Cabinet Which Can Replace Old Style; Making an Attic Room with Wallboard, and, Bottom, a Comfortable Sink

There is this to be said in favor of old houses. Many were built ten, fifteen and twenty years ago when materials were less expensive, labor less costly and in some cases construction better than today. In other words, the stuff was in 'em. They may have grown a bit down at the heels, lack style, but the framework and structure of the house may still be as sturdy as the rock of Gibraltar. In such cases you may be justified in spending considerable money on home modernizing.



I know of one builder who has worked up a profitable business buying old houses in good locations. He remodels them and finds a ready market, for the reason that, in almost every case, the completed house is brimful of individuality and little unexpected things. He tells me that the successful mingling of worthwhile old features with new alterations adds a certain charm you seldom find in a brand-new house.

Finally, dealers of building materials, loan associations, bankers, and many other agencies, are waiting to help you. Some manufacturers have opened service departments and, at no cost, supply highly attractive modernizing suggestions direct from photographs of the old house. Many fine results have thus been achieved.

Home modernizing is a thrifty move any way you figure it. You take your shoes to the cobbler for new soles provided the uppers are in good shape. You replace old piston rings and give your car a new-paint and renickel job because you can see many a good mile ahead and more service from your original investment. Popular Mechanics home building department will be glad to help readers plan their remodeling.

A Colonial Home with Quaint Dormer Windows, or a Spanish Stucco Type, Can Be Had by Remodeling the Old House in the Center Illustration

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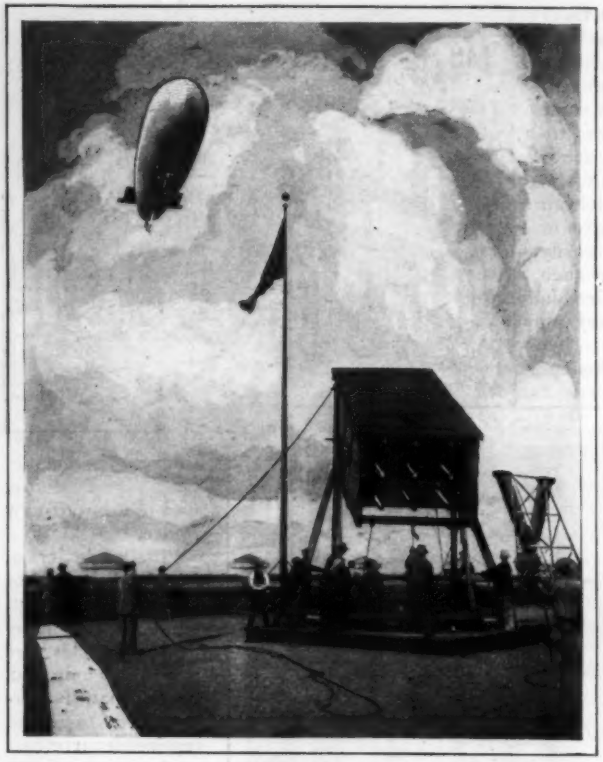
Our Bureau of Information will answer all questions regarding articles appearing in this magazine



Special Horn That Projects a "Beam of Sound" for the Guidance of Aircraft; It Is Effective at 1,500 Feet and More

HORN HELPS GUIDE AIRSHIPS THROUGH DENSE FOGS

Instead of diffusing the sound waves, a horn recently tested in the east, directs a "beam of sound" at a definite point. It has been used in aiding an airship to land from an altitude of 1,500 feet, and engineers believe that it will be of great help in guiding aircraft through fogs.

FRUIT-JAR SEED-CORN TESTER TELLS GRAINS' GROWTH

A simple test to determine the fitness of corn for planting has been devised by the agricultural extension service of the University of Wisconsin. On half of a mat of old newspaper pages, or those of practically any circular not printed on glazed paper, about ten inches wide and ten and one-half inches long, fifty seeds are spread so that no two grains touch each other. This is done after the paper has been thoroughly soaked and crumpled in water. The other half of the mat is then folded down over the grains, and the entire paper rolled up to form a compact bundle. Each end is tied with a string or rubber band, and the roll is placed in a two-quart fruit jar, a small hole is punched in the lid and the cover screwed on securely. In about a week, after the jar has been kept undisturbed in a moderately warm place, the roll is opened and the seeds examined. All sprouted seeds should have both shoots and roots. Those without sprouts are dead; those having roots and no shoots or those with shoots and no roots, should be accounted dead as well as those that have weak-looking sprouts compared with the others. The seeds rated as dead are then counted, the number multiplied by two and the result subtracted from 100. This gives the percentage of germination.

HAND ENVELOPE SEALER HAS NO WICKS OR SPRAYS

A hand-operated envelope sealer, provided with an inverted jar of water, is now on the market. The envelope flaps are passed through a feed which moistens the gum and folds the flap. A companion machine is a stamp container which moistens and affixes stamps, and also keeps count of the number used. It works on the same principle as a date stamp.

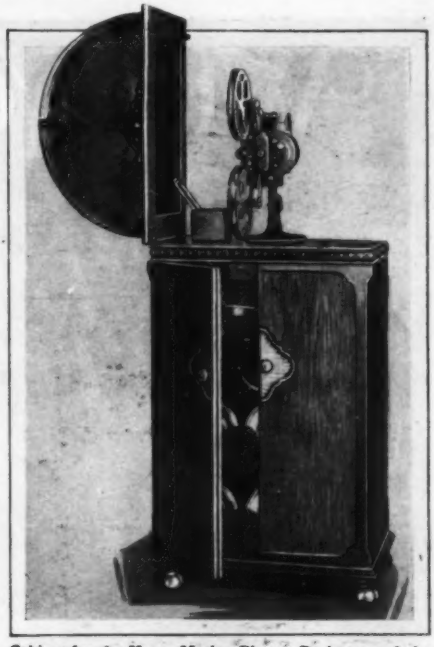
NEON SIGNAL SAVES CURRENT ON ELECTRIC APPLIANCES

To show whether or not various electric appliances in the home are connected, a neon indicator has been introduced to help save current. It consumes but a fraction of the amount of electricity required by ordinary lamps now used for that purpose, and its glow is easily seen both in daylight or under strong artificial light. The device is simply a small glass cylinder filled with neon gas and having electrodes through which the gas is made to glow when the appliance on the same circuit as the indicator is turned on. The unit is also useful on switchboards in theaters, factories and other places having elaborate lighting systems. A glance at the board so equipped will tell the operator which lamp or group of lamps are lighted, when the position of the switches is not so easily interpreted.

RADIO SET BUILT ON BICYCLE ADDS FUN TO TRIPS

With a homemade radio set which he has fashioned, an eastern bicycle enthusiast enjoys music and other programs from various stations while riding through the country. The receiver, with loop antenna, is compactly built, weighs but a few pounds, and does not interfere with the normal operation of the bicycle.

He Has Radio Music Wherever He Rides; Receiving Set Attached to Handlebars Entertains Bicyclist



Cabinet for the Home Motion-Picture Projector and the Films; the Hinged Top Fits Down over Machine

HOME MOVIE-MACHINE CABINET HOLDS REELS AND PROJECTOR

Projector, films and other parts of a home motion-picture outfit are contained in an attractive cabinet with a dome-shaped top to cover the projector. The article forms what corresponds to the projection booth in a theater. The cover protects the projector from dust and damage when it is not in use and saves extra handling of it.

OIL FROM SHIPS KILLS BIRDS BY WEIGHTING WINGS

Alarmed at the number of birds that are killed by oil from ships, a British society has started a campaign to correct the evil. The oil weights the birds' wings and clogs their feathers so that they either cannot fly or become exhausted quickly. Eighty were found dead from these causes recently. The wider use of oil separators on ships has been recommended in order to do away with the necessity of discharging the material upon the water, as is still the prevalent practice.

What You Should

Courtesy Everybody's Magazine

Bombing Clouds with a "Hail Cannon," an Old Idea with No Scientific Standing; Smoke Rings Were Fired Instead of Projectiles

By CALVIN FRAZER

THE WEATHERMAN has several jobs on his hands besides those of recording and predicting the weather. One that takes up a great deal of his time is answering questions.

Every year, thousands of inquiries are received by the United States weather bureau, at its central office in Washington and at its stations throughout the country. As an aid in answering these inquiries the bureau has assembled in Washington the largest library in the world devoted to the subject of weather, containing more than 47,000 books.

Big as it is, the weather bureau library cannot supply answers to all the questions addressed to the weatherman. Many cannot be answered because science itself has not yet found the answers. Plenty of weather mysteries still await solution. Some are unanswerable for other reasons. The bureau is often asked, for example, why there were no rainbows before the flood. The other day a letter came from a correspondent who wanted to know the difference between a cyclone and a volcano. The bureau assumed that the writer meant tornado, and replied accordingly.

What kinds of questions does the public ask the weatherman? There is almost no end to their variety. There are, however, certain questions that are asked over and over again. Some of these relate to the dates and other particulars of memorable storms, cold winters, floods and other outstanding weather events.

At least three or four times a year, somebody asks for information about the "Big Wind in Ireland." This name is applied to a violent tempest that swept over the British isles in January, 1839, causing great destruction by land and sea. Strange to say, though it is almost completely forgotten in the old country, it is frequently heard of in America. It was a recent event at the time Irish emigration to this country was at high tide, fol-

Said to Aid in the Prediction of Storms; an Automatic Static-Recording Device at the Naval Air Station in Washington; Direction of Signals Is Determined by the Loop Antenna

lowing the terrible famine of 1845-46, and the memory of it has been preserved among the descendants of the Irish who came over at that period.

Other famous weather events that people often inquire about are the two Galveston hurricanes (especially the one of 1900), the two St. Louis tornadoes, the Samoa hurricane of 1889, in which American and German warships were lost, the Johnstown flood, the New York-New England blizzard of 1888, and—last but not least—the "Year without a Summer" (1816).

The public is always much interested in record-breaking extremes of weather. There are many questions as to the highest and lowest temperatures ever registered in the United States or elsewhere, the places having the greatest and least rainfall, the strongest winds ever observed, and so on. Statistics on such subjects necessarily vary somewhat from year to year. Several places, for instance, have successively held the blue ribbon for hot weather. For many years this distinction was enjoyed by Wargla, a town in the Algerian Sahara. Then, in 1913, Death Valley, California, established a new world record, with a reading of 134 degrees. This held good until 1922, when it was surpassed by two degrees at the village of Azizia, in the Italian Sahara. The low-temperature record has been held since 1892 by Verkhoyansk, Siberia, close to the arctic circle, with an official reading of 90 degrees below zero.

There has been much uncertainty as to which of the world's weather stations has the greatest average annual rainfall. The latest figure for Cherrapunji, in Assam, is 428 inches. This is rivaled at certain stations having shorter series of observations, including another place in Assam, Manoyuram, where measurements were made for only five years and then discontinued. The average for this period was 499 inches a year. Another notoriously wet spot, the summit of Mount Waialeale, in Hawaii, is so difficult of access that measurements are made there only once a year with an enormous rain gauge—the largest in the world—designed to catch and store the rainfall of an entire year.

The average yearly rainfall at this station, up to date, is 427 inches. The driest known spot in the world is Iquique, Chile, with an average annual rainfall of only two-tenths of an inch. To the frequent question, "Are there any rainless places in the world?" the weather bureau replies in the negative.

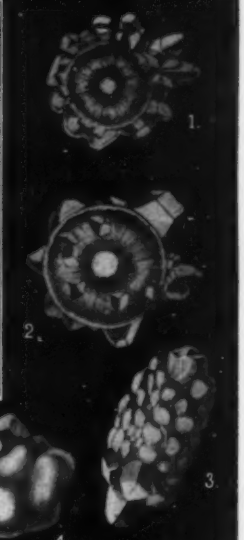
The rainiest known place in the United States is Glenora, Tillamook county, Oregon, where the rainfall averages 131½ inches a year, and the driest is Death Valley, where it averages a little over one and one-half inches a year. Whether the heaviest snowfall of the United States occurs in the high Sierra of California or on the upper slopes of Mount Rainier, Wash., is an unsettled question.

Chicago's nickname, "the Windy City," raises the question whether the city is actually windier than others. The answer is that the wind measurements in Chicago show a higher average than in any other large city of the United States (only slightly higher than in New York), but are surpassed at many smaller towns on both the Atlantic and Pacific coasts. The strongest wind ever measured in this country was nominally 186 miles an hour, registered on the summit of Mount Washington, N. H., Jan. 11, 1878, but certain necessary corrections reduce this figure to about 140 miles an hour. Far stronger winds occur in tornadoes, but they have never been measured.

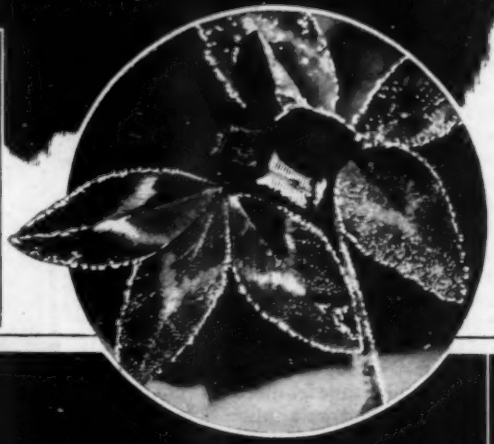
"How large are the biggest hailstones?" is a perennial question. Huge masses of ice have sometimes been found after hailstorms, but they were doubtless the result of several hailstones freezing together while lying in a heap on the ground. The greatest possible size of a single hailstone cannot be stated with any certainty. In August, 1925, a hailstone, weighing four and one-half pounds, fell through the roof of a house at Heidgraben, Schleswig-Holstein. This stone was nearly ten inches long. There have been several reports of even bigger hailstones, but they

Big Rain Gauge; Weather Post in Greenland, and Record of Lightning Bolt in Fused Sand

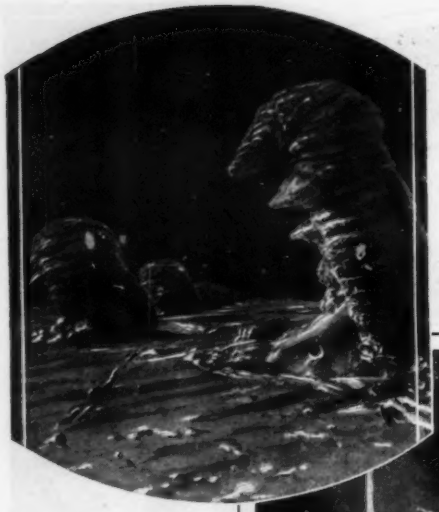
Excellent Photograph of a Lenticular Cloud with Thin Edges That Often Are Iridescent; These and Other Clouds of Curious Aspect Inspire Many Queries



Hailstones of Curious Shapes Gathered after a Storm in Central Europe, and False Dew on Clover, Drops Exuded by the Plant Itself and Not Condensed from the Atmosphere; How Large Are the Largest Hailstones, Is a Frequent Question; One, Weighing Four and One-Half Pounds and Ten Inches Long, Fell through the Roof of a House in Germany in August, 1925; Other Larger Stones Have Been Reported but Are Not So Well Authenticated; the Various Layers of the Stones Are Formed by the Irregular Fall of the Lump from the Sky to the Earth



One of the Most Mysterious Night Clouds; It Glows in the Darkness in Summer, Probably Because of Sunlit Dust at a High Altitude



Fanciful Shapes Formed by Frozen Fog; Ball of Lightning Killing Professor Richmann, and Ice Fringe on Dead Plant

were not so well authenticated.

"Why," the weatherman is asked, "is a hailstone built up, like an onion, of successive layers?" Hail is formed in the violent updraft of air at the front of a thunderstorm. In this turbulent region the hailstone, first frozen at a high level, makes several journeys alternately up and down as it encounters stronger or weaker rising currents; at one time gathering a coating of snow aloft, and at another a coating of ice from rain below, until finally, on account of its large size or on account of a weakening of the upward blast, it falls to the ground.

The weather bureau is often consulted about the merits of two expedients for averting hailstorms that have been tried on an extensive (and expensive) scale in Europe, viz., "hail-shooting" and the "hail rod." The former consists in bombarding the clouds with funnel-shaped mortars, which discharge no projectile but send out smoke rings like those often seen over the funnel of a locomotive. The hail rod, in its latest form, is merely an overgrown lightning rod, erected on a steel tower or at the top of a high building. Neither of these devices rests on any scientific basis, and both have lost much of their once unbounded popularity in the Old World.

In times of drouth, the bureau is besieged with appeals for information about methods of making rain. The feat is not impossible, but all known methods are vastly more expensive than the results would justify. One proposed scheme is to set up a barrier packed with ice in the path of moisture-bearing winds; an idea inspired by the familiar "sweating" of an ice pitcher. Dr. W. J. Humphreys, of the weather bureau, has figured up the expense of operating such a contrivance under average conditions in a western state where the yearly cost of water for irrigation is now two dollars an

Like Jellyfish in the Sky; a Good Example of Alto-Cumulus Clouds with Tentacles and Streamers the Weathermen Call "Fallstreifen"

acre. He finds that the thing would cost about $20,000 an acre per annum!

One of the endless tasks of the weatherman is explaining the difference between the various kinds of solid and liquid moisture condensed from the atmosphere. Here are some of the facts in a nutshell: Hailstones are part ice and part snow and are a product of thunderstorms. Sleet consists of small fragments or balls of clear ice formed by the freezing of raindrops. Graupel (sometimes called soft hail) is a granular form of snow, consisting of miniature snowballs. Glaze is a coating of clear ice formed by rain that freezes as it falls. A heavy coating of glaze constitutes an ice storm, such as may cause great destruction of trees, wires, etc. Rime is a deposit of ice from drifting fog. Both glaze and rime are dangerous to aircraft. Hoarfrost is a deposit of ice crystals on cold surfaces, generally by direct condensation of atmospheric water vapor without passing through the liquid form. When a cold surface condenses water vapor in liquid drops, the result is dew. The drops seen on vegetation in the early morning are not always dewdrops. Many —especially the big ones—consist of water exuded by the plants themselves and are called "false dew."

Several phenomena of the atmosphere are so uncommon that each occurrence of one of them calls forth letters of inquiry from the public. Among these rarities are the muff-shaped masses of snow known as "snow rollers," which are sometimes found by the thousand lying on snow-covered fields and lawns. They are formed by the wind when the temperature is just right to give the snow the necessary cohesion, and each lies at the end of a long trough marking the path along which the snow has been rolled. Then there are the delicate curved ribbons of ice that grow out from the dry stems of certain plants. Their mode of origin is not well understood. They are called "ice fringes."

Two other rare phenomena that the weatherman cannot explain to his own satisfaction, much less to that of the layman, are ball lightning and will-o'-the-wisp.

St. Elmo's fire—a harmless brush discharge of electricity from pointed objects —is something that most people have read of but few have seen. It is commonest on high mountains; less common at sea.

Widespread dustfalls, sometimes covering thousands of square miles, call forth many queries and thus make work for the weatherman, who can generally trace the

dust to its source by consulting current weather maps. There was a case of this kind last April, when fully 2,000,000 tons of dust, blown up from the soil of southern Russia, fell over countries to the westward. Rain, reddened with dust blown from the Sahara, explains the showers of blood that have occurred many times in southern Europe, where they no longer arouse such superstitious terrors as they did in former ages. The "sulphur" sometimes said to fall from the sky is pollen blown from pine trees.

Ask me another is a game that most people play for amusement, but it is part of the weatherman's everyday business.

SEE SAFER PLANE LANDINGS WITH NEW ALTIMETER

Much of the guesswork and hazard of landing an airplane will be eliminated, experts predict, with the aid of a sensitive altimeter that shows the elevation of the plane with great accuracy even when it is but a few feet from the ground. In fact, the closer the ship approaches earth, the more accurately is the altitude registered, for the instrument operates by reason of the ground's electrical capacity. Few altimeters of the usual kind can be depended upon for accurate readings below 1,000 feet. The new altimeter, at fifteen feet, for instance, shows the altitude within a few inches, regardless of the speed of the plane, and this is an important service, for many serious accidents have occurred in crashes as low as this. The principle of the device, which is the invention of Dr. Ross Gunn, of the naval research laboratory, is familiar to physicists, but heretofore it has not been successful with an altimeter under normal plane operations, because, at high altitudes, the changes in the electrical capacity are extremely small.

COUNTS SMALLEST SEEDS

A counter which not only counts small seeds in lots of one hundred, but then plants them evenly spaced in test boxes for germination has been built by the department of agriculture. One hundred holes, in ten rows of ten each, are drilled in a brass plate. The plate is mounted over an air-tight box, connected to a vacuum pump. An excess of seed is spread over the plate, the pump valve is opened, and the box gently shaken, then turned upside down. One hundred seeds remain, held to the holes by the vacuum, while the rest fall off. The box is then placed upside down over the test bed, the valve closed and air admitted, when the seed drop into place, properly spaced.

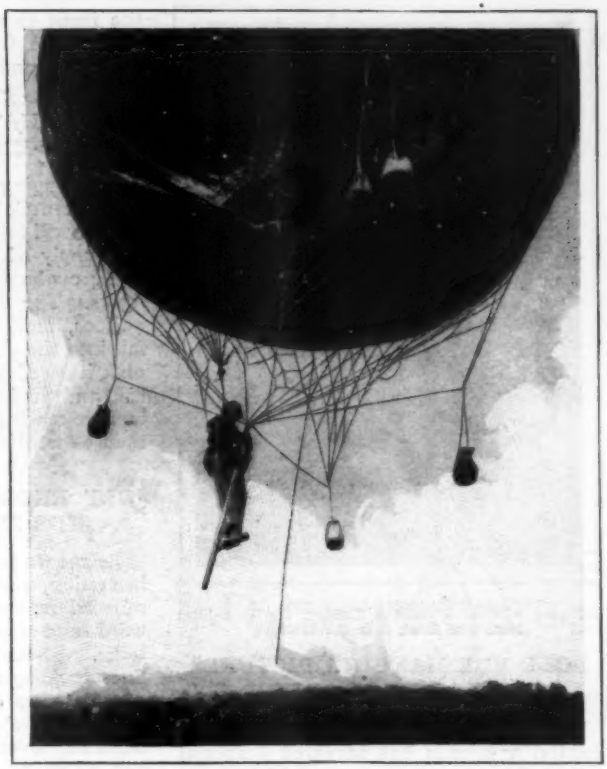
ELECTRICAL INCENSE BURNER ELIMINATES MATCHES

Incense burners equipped with electric heating units, to eliminate the use of matches, have been invented by a Madison, Wis., manufacturer. The burners are fitted with an extension cord to plug into any light socket, and have a small turn switch in the base. The incense cone is placed directly on the heating element, the switch turned for a few seconds, and the incense then burns from the bottom up, instead of the top down, which creates, it is claimed, a better smudge. The burners are made of both brass and porcelain, the latter style coming in colors, or white, to be decorated by the purchaser.

The Turn Button on the Base Operates the Electric Lighter and Starts the Incense Burning

IMPROVED "POLICE" WATCH RADIO STATIONS

A better means of policing the air lanes, to determine when broadcasting stations wander from their assigned wavelengths, has been devised in the form of a central monitor station and sixteen secondary measuring units to be installed in motor cars and at points in various parts of the country. With this improved apparatus, which has been worked out by the radio division of the department of commerce, it will be unnecessary for the inspectors to go to the different stations in their areas. They can make a complete and accurate checkup in their own offices. The central monitor station is planned for some place in the middle west. It will maintain a higher degree of accuracy than the other units and will be more elaborate in character. Ten of the secondary depots are to be located in radio-inspection offices, and the other six installed in motor cars. The monitor apparatus consists of a high-class selective and sensitive receiving set which will cover the entire range of radio frequencies.



Courtesy The London Daily Mail

Balloon Jumping Is Made Easier and Safer with Aid of Pole to Help Clear Ground and Avoid Obstructions

POLE AIDS BALLOON JUMPER IN TAKING OFF

To help get off the ground and to rise over obstructions, a long pole has been found effective by persons who follow the sport of balloon jumping in England. The pole can be used in many ways as, for example, to push away from the tops of trees and houses, and is employed in much the same manner as a vaulter uses his pole in clearing a bar. Perhaps most important of all, it is a safety aid to prevent landing on electric wires. To help relieve the weight, the pole may be attached to the balloon rigging.

SHAVING-CREAM TUBE SERVES AS BRUSH HANDLE

Convenience and simplicity are afforded in a shaving brush which has a tube of cream for its handle, saving room in the traveling kit. To apply cream to the bristles, all that is necessary is to turn a valve and squeeze the tube.

Shaving Brush with Tube of Cream for Handle

© U. & U.
Hanging Pictures without a Ladder; the Pole Slips Wire and Hook over the Molding

POLE FOR HANGING PICTURES SAVES USING LADDER

To hang pictures without the need of a ladder, a woman has invented a special pole and holder arrangement which places the wire and hook over the molding while the user stands on the floor. It is designed to keep the picture from falling off, is quickly adjusted, and is long enough to be of service in all rooms.

COWLING FOR AIRPLANE MOTOR INCREASES SPEED

Resembling a large bowl, a cowl for radial air-cooled airplane motors cuts down wind resistance, helps assure proper functioning of the engine and increases the plane's speed, tests with an army pursuit ship have shown. Without the cowl, a test ship made 118 miles an hour with the propeller at 1,900 revolutions per minute, but with the cowl, the same ship attained 137 miles an hour, other factors being the same. The attachment is inexpensive and is expected to effect great savings in the operation of this kind of airplane. In operation, the bowl lets in sufficient air at the front to cool the cylinders, and the flow issues from the rear in a smooth stream around the fuselage.

FISH IN HATCHERY POOLS GROW LARGER UNDER LIGHTS

By hanging electric lights over trout pools at a Colorado hatchery, a way has been found to provide the fish with an extra supply of food on which they thrive and grow larger than in pools without the lights. The rays of the lamps lure mosquitoes, moths and other insects which fall into the water and are devoured. The plan has reduced the cost of feeding the fish, and the benefits reaped from the system are reported to be such that they more than offset the expense.

JOLT RECORDER FOR RAILWAY AIDS SMOOTHER RIDING

To record jolts and jars while a train is in motion, a unit employed by an English railroad registers sideways motion, backward and forward action and upward jerks. These are indicated by graphic lines made by three pointers while the apparatus rests on the floor of a car. On the basis of these graphs, it is possible to make improvements in the track and roadbed, as well as in other equipment, and thus bring about smoother operation.

How Smooth Is the Ride? This Gauge Tells by Waving Lines When the Railway Car Sways

An "S" Boat, Similar to the One Used in Measuring the Force of Gravity under the Sea; the Submarine Is Just Emerging after a Dive during Maneuvers with the Fleet

A FEW weeks ago the secretary of the navy took the unprecedented step of turning an American submarine, complete with crew, over to a foreign scientist to use for two months. The visitor from overseas, Dr. F. R. Venin Meinesz, member of the Dutch geodetic commission, sailed away from Hampton Roads on the "S-21," cruised down to Key West and around to Galveston by way of the Sigsbee Deep, one of the holes in the sea, sailed out to St. Thomas, in the Virgin islands, Guantanamo bay, Cuba, and, after visiting the Nares Deep and the Porto Rican coast, returned to his starting point.

Dr. Meinesz was no stranger to submarine travel, for he had already been around the world in a Dutch submarine, traveling most of the way under the surface. That is undoubtedly the longest trip a civilian ever made in an undersea boat, and it was the reason why the American navy was glad to give him an S-boat to use for two months. For Dr. Meinesz is traveling under the waves to measure the thickness of the earth's crust, reweigh the earth, and also learn more about the great undersea earthquakes from which new islands are born, or old ones engulfed, tidal waves originated, the sea bottom changed, and readjustments started that have a reflection later in earthquakes affecting populated lands.

Since the theory was first advanced, some years ago, that the earth's crust weighs virtually the same in every part of the globe, though it may tower five or six miles above sea level in one place and be five or six miles under sea level in another, scientists have been busy gathering evidence to prove their case. It was this work that has taken Dr. Meinesz around the world under the sea.

The scientific name of the theory he is seeking to prove is isostasy. It is based on the fact that the solid outer crust of the earth rests on an inner ball of plastic material, just like the arctic-ice sheet rests on the waters of the polar sea. The crust, scientists agree, must be composed of lighter material than the central ball, and, in order that equilibrium may exist—isostatic condition—the density of the crust in various parts of the globe must vary.

As Dr. Meinesz describes it, if the surface of the globe, down to the bottom of the crust, which is judged to be about sixty miles thick, was cut in squares of 100 miles each way, and all the squares weighed, it should be found that the weights were practically the same, despite the fact that the crust of continental portions would be, in some cases, ten miles or more thicker than sections taken from the depths beneath the sea.

To prove that point, he set out to measure the attraction of gravity at the deep holes in the sea, to determine if it was

The Naval Observatory at Washington, Where Dr. Meinesz' Pendulum Apparatus Was Checked with American Equipment, to Insure Both Would Give the Same Readings

really true that the density of the material there was sufficient to exert the same attraction as the material composing continents and mountain ranges.

In 1923, he started out from Holland for the Dutch colony of Java, sailing in a submarine by way of the Mediterranean, Red Sea and Indian ocean. Two years later, with improved apparatus, he made another experimental trip from Holland to Port Said, and in 1926 started again from Europe and went to Java, by way of the Panama canal and across the Pacific, so his voyages completed the circumnavigation of the world.

On these voyages he determined the force of gravity at more than 200 points, his observations showing in a general way that isostasy exists in the crust under the sea. As there are 140,000,000 square miles of ocean area, however, many more observations are needed to check the theory.

It was for that reason that the Carnegie Institution invited him to America, and the navy hydrographic office arranged to place a submarine and an escort of two "eagle" boats at his disposal. The trip was planned to include the Nares, Sigsbee and Bartlett deeps. The first, lying north of Porto Rico, has a depth of 5,000 fathoms, or 30,000 feet.

The observations are all made from a depth of about 175 feet or more under the sea, to eliminate the pitching and tossing due to the waves, the factor that always prevented experiments from a surface vessel. The apparatus used consists of three pendulums swung in a brass box, some two and a half feet square. The box rests in a frame, mounted on a universal joint, so that it will remain vertical despite any rolling of the ship. A chronometer and electrically driven photographic roll to measure the pendulum swings complete the apparatus.

REFLECTOR ON SADDLE STIRRUP GUARDS NIGHT RIDERS

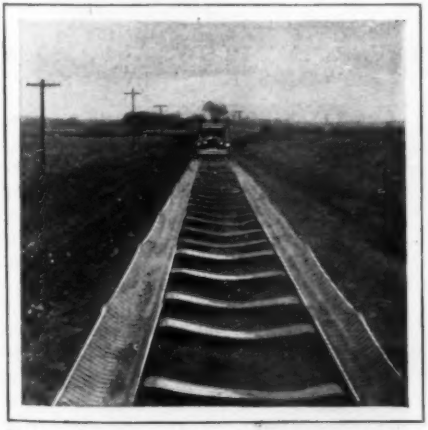
Attached to the left stirrup, a red-glass reflector gleams under the rays of automobile headlights and other sources, so that equestrians can be more easily seen. The device is put on in a few seconds and, when not in use, fits into a leather case which can be attached to the saddle.

KEEP SPECIMENS BY FREEZING FOR RUSSIAN MUSEUM

Human and animal specimens can be preserved for centuries in a huge "refrigerator" museum which a Russian society is planning for Moscow. It is proposed to spend about $5,000,000 on the scheme, and justification for the idea is seen in nature, where the bodies of monster animals, such as the mammoth, have been found preserved in ice in such good condition that the flesh is fit for food. The plan has had a curious political expression in Moscow, where two professors have embalmed the body of the dictator, Lenin. It is not mummified, but is preserved in a moist atmosphere so as to lose no water and remain lifelike. Pamphlets have been printed, explaining to the peasants, who still are inclined to be superstitious, that the body has been kept in its present condition, not by a miracle, but by science.

PIPE TRACK FOR AUTO TRUCKS AIDS CONSTRUCTION WORK

To run heavy truck loads of materials over soft dirt roads, an Iowa contractor employs a track made of sections of fifteen-inch pipe, tied together with strips to prevent spreading. The pipe is corrugated in order to afford extra traction, and the plan has proved a saver of both time and expense in the construction of roads and on other jobs.



Pipe Track on Soft Road for Hauling Heavy Loads of Materials without Miring Down

Gathering Fruit in Basket That Has Removable Bottom, to Prevent Bruising

DUMP-BOTTOM FRUIT BUCKET SAVES PICKERS' TIME

Faster picking, better protection for the fruit and greater convenience for the workers are among the features claimed for a fruit-picking bucket that is emptied through the bottom instead of in the usual way. This is accomplished simply by operating a cord fastener which releases the canvas flaps that constitute the bottom. Fruit may be placed gently in the box and the bucket lifted from around it, thus eliminating needless and rough handling. Being equipped with soft, broad straps, the bucket is worn by the picker in comfort and ease. It is protected on the inside to prevent bruising the fruit.

¶Popular Mechanics Magazine does not publish the name of the maker or seller of any device described in its pages, but this information is kept on file and will be furnished free upon application to our Bureau of Information.

Kitchen Alcove for the Stove Has a Sliding Glass Door That Shuts Out Heat and Odors

GLASS-DOOR CABINET FOR STOVE STOPS SMOKE AND ODORS

To promote cooking comfort, a cabinet with a sliding glass panel to inclose the gas range has been introduced. It carries off smoke and unpleasant odors, helps to keep the kitchen cool and also provides storage space for pots and pans. When the glass panel is down, the cook can watch the progress of foods on the range. In the dome of the cabinet is a blower to carry off the fumes through the stove flue. The inclosure is made of steel, finished in a number of different tints in order that the selection of one harmonizing with the decorations of the kitchen may be an easy matter.

¶We want all our readers to write us freely and often whenever they wish additional information on articles published in this magazine. Address Bureau of Information, Popular Mechanics, Chicago.

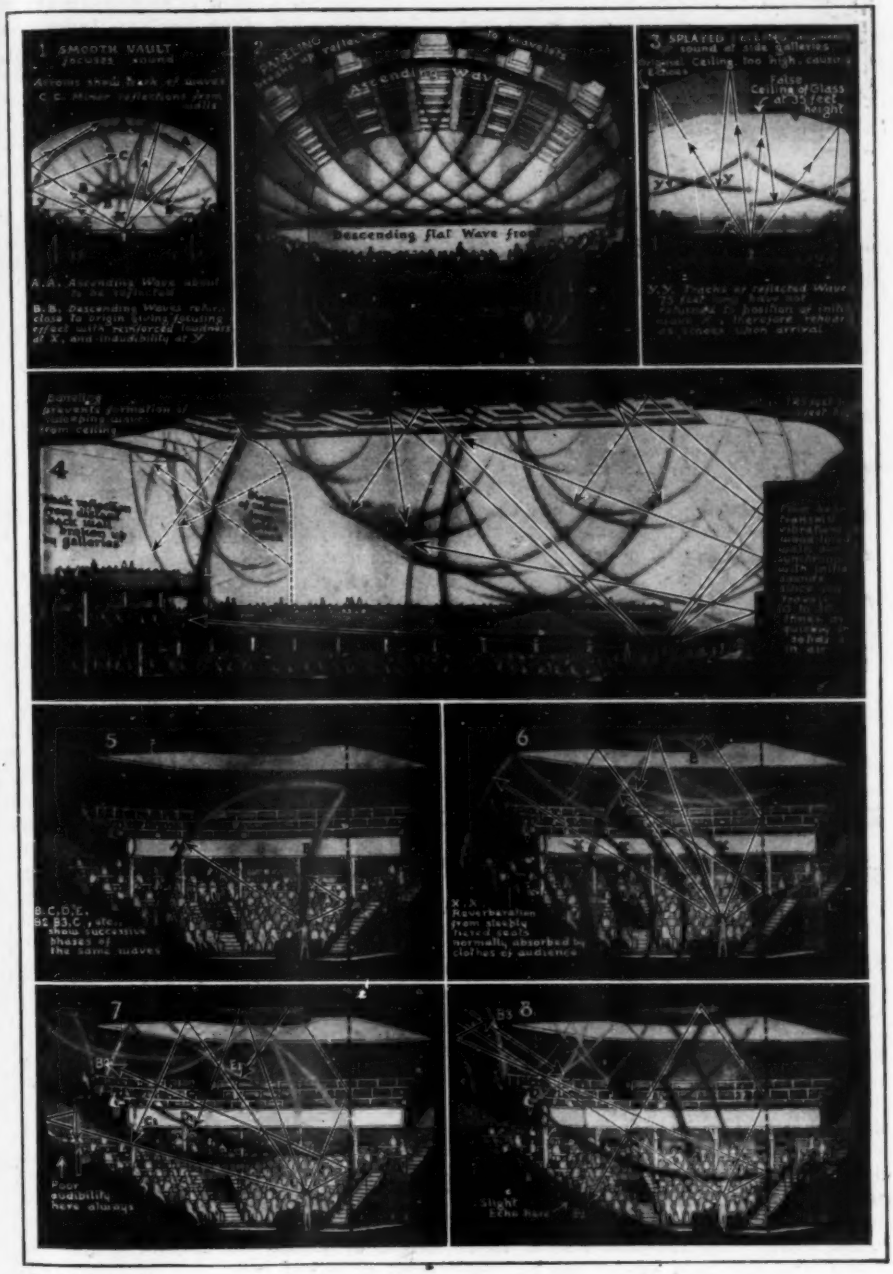
PHOTOGRAPHING SOUND HELPS IMPROVE BUILDINGS

Photographing sound waves set up in models of public halls, may enable architects to correct acoustical errors before they build. The national physical laboratory at Teddington, England, has developed a process which has met with considerable success. Models of the proposed auditoriums are built to scale and tested in two ways. In one, the models are placed on their side, filled with water and a plunger operated at the point where the speaker will stand. The ripples in the water correspond to those which would be produced by sound waves in the air. In the second method, a combination of sound wave and light wave is used to give a visible photograph of the path the sound will travel. The drawings on the opposite page explain some of the lessons learned. In No. 1 a smooth vaulted ceiling proves bad for acoustics when its radius is less than twice the height of the hall. In No. 2 the fault has been corrected by introducing deep paneling to break up the reflections of the waves. No. 3 shows how the hall of the House of Commons was improved by building in a false ceiling of glass to reduce the height of the room. No. 4 shows how skillful design in the famous Leipzig Gewandhaus breaks up sound waves. The last four show the movement of a sound wave through a complete cycle in the lecture hall of the Royal Institution, in London, where hearing is very good.

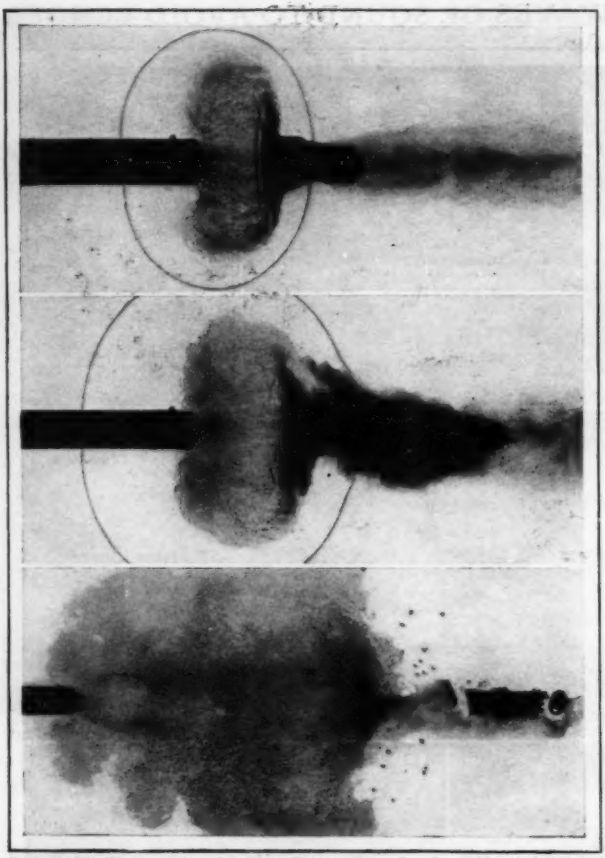
LEVER THAT BLOWS AUTO HORN FITS ON STEERING WHEEL

Blowing the horn is simplified by an extension lever fitted to the steering wheel. It is easily attached and saves removing the hands from the wheel when the signal is to be sounded.

CONTROLLING WAVES OF SOUND TO AVOID ECHOES


1 SMOOTH VAULT
Arrows show path of waves
C.C. Minor reflections from walls
A.A. Ascending Waves about to be reflected
B.B. Descending Waves return close to origin giving focusing effect with reinforced loudness at X, and inaudibility at Y
Ascending Wave
Descending flat Wave from
3 SPLAYED
sound at side Galleries
False Ceiling of Glass at 35 feet height
Y.Y. Tracks of reflected Waves
4
5
B.C.D.E.
B1.B2.B3.C etc.
show successive phases of the same waves
6
Reverberation from sloping fronted seats normally absorbed by clothes of audience
7
Poor audibility here always
8
Slight Echo here

© S. W. Clatworthy



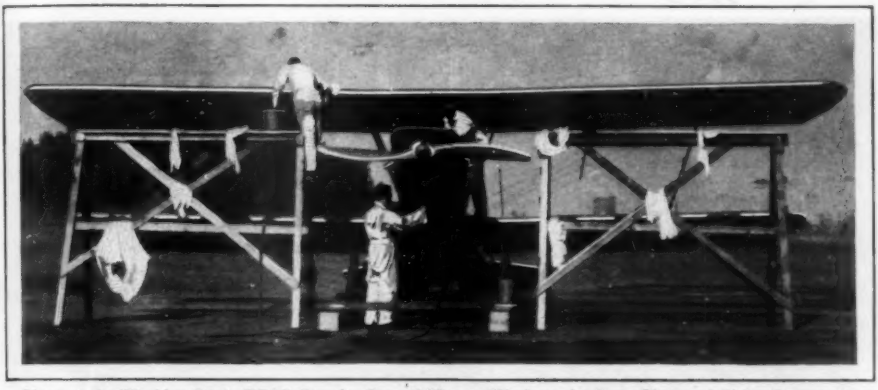
Remarkable Photographs of a Shot Charge Emerging from Muzzle of Gun; Note the Wads and Shot in Bottom Illustration

SPLIT-SECOND SHOTGUN PHOTOS SHOW FIRING RESULTS

What happens when a shotgun is fired? Spark photography, which permits exposures of one-millionth of a second, supplies the answer with a graphic and accurate record of practically every stage from the time the trigger is pulled until the charge is well away from the muzzle of the gun. Three such photographs are shown here. The first is of the shot and wads just after leaving the muzzle. The charge is still being accelerated by the outrushing gases. The heavy dark line inclosing the gas at the end of the gun, is a sound wave. The top-shot wad is seen blown from the head of the charge. In the next photograph, the shot is approximately four inches from the muzzle and, in the next, about fifteen inches. Note how the shot are beginning to spread. Pictures such as these are especially valuable to ballistic engineers. Among other things, they show what a large gas leakage there is before the shot reach the muzzle.

CHINESE IDEAS AID WESTERN WORLD

China is generally regarded as being far behind the western world in many respects, but the nation has given other countries many valuable ideas. For instance, the United States army signal corps recently adopted the plan of tying whistles to carrier pigeons to frighten away hawks—a custom practiced in China centuries ago. Groceries in this country sold quantities of "potsai," or Chinese cabbage, this year; large red Chinese persimmons were found in many markets, while an essential ingredient in many salves and ointments sold by drug stores, has been used for centuries in the Orient. Chinese producers furnish us about 100,000,000 pounds of tung oil every year; our cotton growers have adopted one of their methods of distinguishing fertile from infertile cotton seeds by placing them all in water and planting only those that sink, and the Chinese are generally regarded as the discoverers of gunpowder. India ink is really Chinese ink. Dominoes, silk, tea, playing cards, dice, wood and rice paper, lacquers, artificial pearls, goldfish, Chinese lanterns, jade and many fruits are among other articles of great variety with the origin of which the Chinese people has been accredited.



Plane at the Washing Rack, Which Permits Several Men to Work at the Same Time and Helps Protect the Wings and Fuselage from Damage While They Are Being Cleaned

RACK FOR WASHING PLANES SAVES WORKERS' TIME

Airplanes can be washed in a few minutes with the aid of a rack introduced at a western flying field. It consists principally of scaffoldlike platforms, equipped with water and air-drying hose, soap mixtures and all other necessary articles. The pilot may taxi up to the rack and depart in fifteen minutes or so with a spotless ship. The rig is large enough to accommodate four men at one time, two to clean the wings, one for the motor and the fourth to clean the fuselage. It can be set up quickly and is easily stored away.

BOOKS AT THREE CENTS EACH SEEN IN CAMERA PROCESS

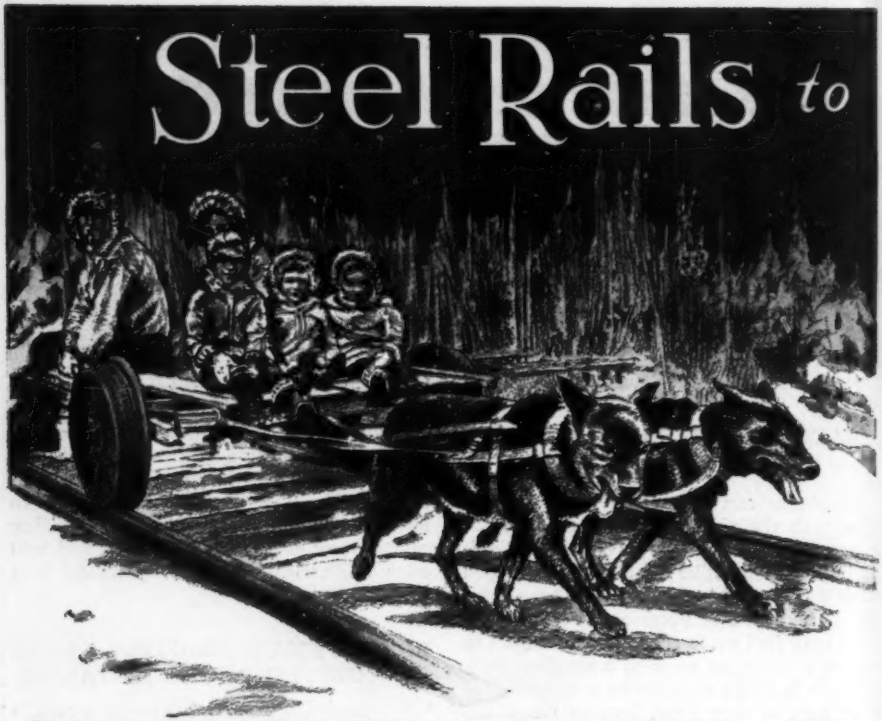
Copies of costly books at three cents each may be enjoyed as a result of a photographic process Prof. E. E. Morean, of the University of Southern California, has developed. With a reducing camera, the pages of a fairly large book can be reproduced on a plate a few inches square and in not more than ten minutes. Copies of the plate can be made at three cents each and then shown, page by page, on a screen in any size desired. The shift from leaf to leaf is made simply by pressing a button. The camera and projector can be furnished at moderate cost. The method is expected to have special application in the recording of rare and expensive volumes, and will enable libraries to file many books in a small space.

New Kind of Plate for Printing; It Can Be Sent Cheaply by Mail Because of Light Weight

LIGHTWEIGHT PRINTING PLATE SUBSTITUTE FOR METAL

Composed of a special material which is so light that it may be sent cheaply through the mails, plates from which illustrations, text and other matter may be printed in newspapers, have been introduced as a substitute for the metal kind. The plate is ready for use on the presses except for tacking it to a type-high wooden block. This eliminates the need for casting, and so will enable plants that have no facilities for this work, to receive and publish material that they otherwise could not handle. The composition plate is said to be fully as durable as metal and produces satisfactory impressions. In the process of manufacture, the material is subjected to a pressure of 4,500 pounds. Numerous publications are now using these plates.

Steel Rails to



The Forerunner of the Muskeg Express, a Handcar and a Pair of Dogs, Provide Transportation on the Hudson Bay Line between the Arrivals of the Weekly Trains

By J. EARLE MILLER

SOME time next spring, along about May 15, a golden spike will be driven into a cedar crosstie on the shores of bleak Hudson bay, and all the United States, Canada and Mexico will have direct railroad service to the Arctic and the land of the midnight sun.

For the first time in the history of North America, a two weeks' summer vacation may include an arctic trip into the land where the sun never sets all summer long, a trip rivaling the European journey to the famous fjords of Norway. It will pass through the land of the Crees, over the Height of Land and down through the Great Barrens, where no trees can grow, and out to the land of the Eskimo, on the shores of the great bay.

To get the steel rails to the inland sea the famous navigator found, and where he died when cast adrift by his mutinous crew, the weirdest, strangest railroad job ever undertaken in North America has been going forward across the frozen north in winter, with temperatures of fifty below zero, and over the oozing muskeg swamps in summer, when the thermometer rises to the nineties.

From the war-time trenches of Europe came an idea that made the work through the swamps possible—duck boards, as the soldiers called their wooden sidewalks. Twenty-one thousand of them were built in the winter of 1927-28, freighted out on sleds ahead of the end of steel, and distributed in caches every ten miles. Placed end to end, they would have made a wooden sidewalk of some twenty-nine miles in length.

Instead of steam shovels, graders, tractors and horses—all the modern equipment usually associated with railroad building—the contractors went back to the days when the first transcontinental

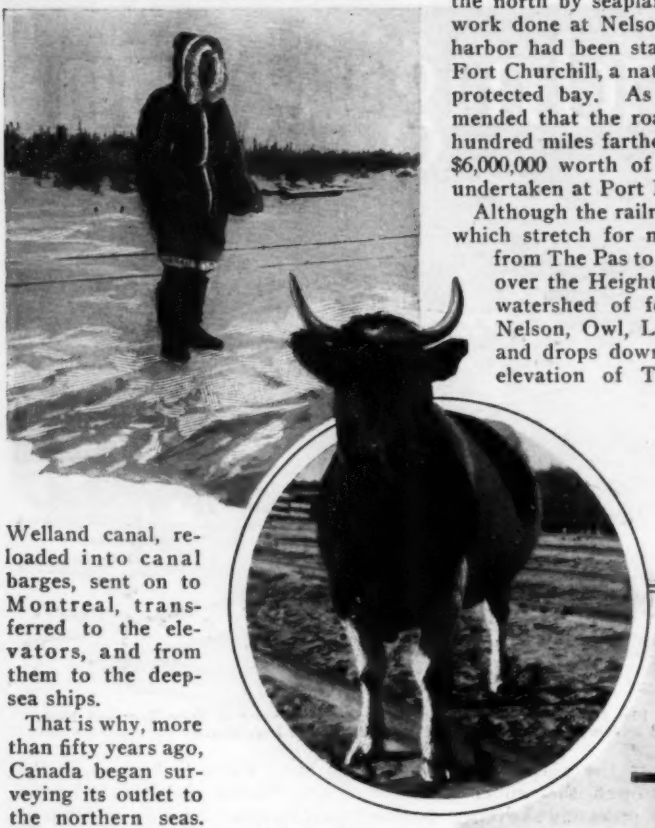
the Midnight Sun

Freighting Supplies for the Flin Flon Branch; the Giant Tractors Hauled Forty to Sixty Tons and Never Stopped Running Day and Night for Week after Week Last Winter

line was pushing across the plains and built their railroad through the wilderness with wheelbarrows, picks and shovels, for nothing heavier could navigate the muskeg in safety.

A muskeg swamp is nothing but reindeer moss and decayed vegetation. In places, the railroad engineers found the perpetual-frost line only six inches under the surface. A few feet away, the gathering of water might draw the frost during the summer to a depth of six feet or more. The frost itself is in many places twenty feet or more in depth. To get a permanent water supply for the tanks supplying the locomotives, huge wells were dynamited down below the frost line to reach seepage water from near-by lakes and streams, covered over with triple-insulated roofs, and the water tanks themselves are surrounded by houses and heated throughout the winter, with the stovepipes passing up directly through the tank of water.

Wheat, and not tourists, sent the steel to Hudson bay. From Saskatoon, in the center of the Alberta and Saskatchewan prairies, to Liverpool by way of Hudson bay is only 3,791 miles, whereas it is 5,213 miles by way of the Great Lakes and the St. Lawrence, the present rail-and-water route. That difference of 1,422 miles doesn't tell half the story. From Fort Churchill, the terminus of the Hudson bay railroad, to Liverpool is almost exactly the same distance as from Montreal, where the wheat now goes on ocean liners to Liverpool, so the two sea hauls will be virtually the same length. But from Saskatoon to Fort Churchill is only 845 miles, while from Saskatoon to Port Arthur, at the head of Lake Superior, is 1,142 miles. Wheat loaded on cars in the prairie provinces can be delivered direct to the elevators on Hudson bay without rehandling, and with a shorter rail journey than that to the head of the Great Lakes. Wheat shipped via Port Arthur must be reloaded into lake grain carriers, sent down to the



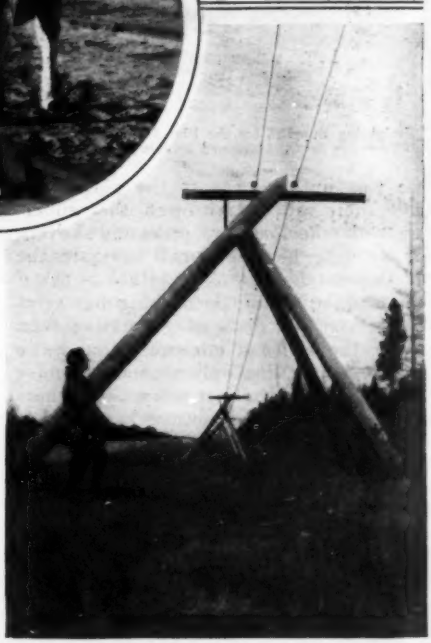
Welland canal, reloaded into canal barges, sent on to Montreal, transferred to the elevators, and from them to the deep-sea ships.

That is why, more than fifty years ago, Canada began surveying its outlet to the northern seas. Work didn't get started until 1906 and 1907, when the first stretch from Hudson Bay Junction, in northeastern Saskatchewan, was built in to The Pas, on the banks of the Saskatchewan river. In 1911, contracts were let for the road to the bay, then designed to go to Port Nelson, at the mouth of the Nelson river, and 330 miles actually built to the Kettle Rapids on the Nelson. The war and business depression stopped the work, and for fifteen years the twin streaks of rust through the muskeg swamps slowly sank into ruins. In 1926, Canada was ready to rehabilitate the line already built and push the steel on to the bay, but in the meantime there was a growing opinion that Port Nelson was a poor terminus.

Frederick Palmer, a famous English engineer, was brought over and rushed to the north by seaplane. He surveyed the work done at Nelson, where an artificial harbor had been started, and also visited Fort Churchill, a natural harbor in a well-protected bay. As a result, he recommended that the road go to Churchill, a hundred miles farther north, and that the $6,000,000 worth of development already undertaken at Port Nelson be abandoned.

Although the railroad over the swamps, which stretch for most of the 512 miles from The Pas to Fort Churchill, passes over the Height of Land, crosses the watershed of four great rivers—the Nelson, Owl, Limestone and Wier—and drops down from the 1,190-foot elevation of The Pas to ten feet above sea level at Churchill, the greater part of it leads through flat, undrained country.

All construction supplies had to be

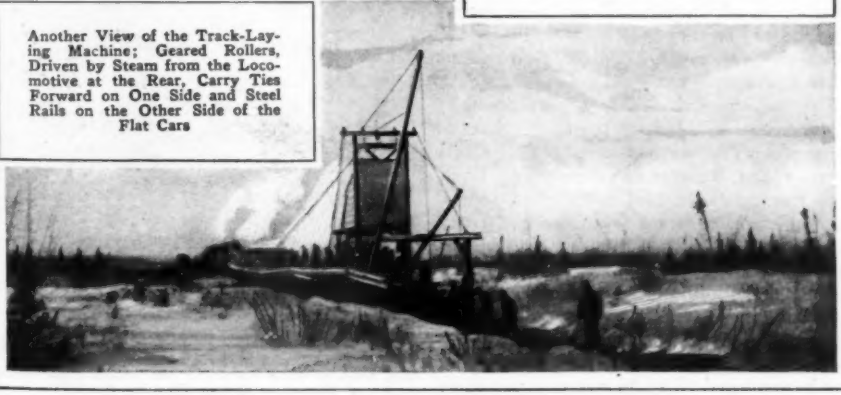


Claude Johnson, Railroad Engineer, in Charge of Construction at the End of Steel, the "Farthest North" Cow at Mile 347, and Frost-Proof Telegraph Poles

The Track-Laying Train Putting Down Steel at the Edge of the Great Barrens Last Fall; the Train Can Lay a Mile or More of Crossties and Steel Rails Each Working Day

Driving Piles for Approach to Bridge over the Wier River, While Waiting for the Snow to Go Off Last Spring; Wooden Bridges Are Replaced by Steel When the Track Catches Up with Builders

Another View of the Track-Laying Machine; Geared Rollers, Driven by Steam from the Locomotive at the Rear, Carry Ties Forward on One Side and Steel Rails on the Other Side of the Flat Cars



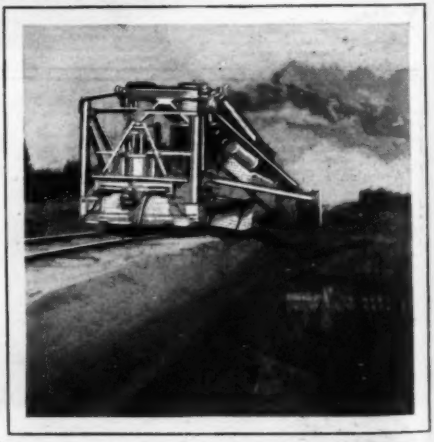
freighted into place during the winter months, using sleds drawn by either horses or tractors. Every ten miles a construction cache was placed in a log and canvas camp. Each cache, to supply the workers for five miles in either direction, contained sixty tons of supplies, forty tons being food, and twenty tons, wheelbarrows, picks, shovels, tents, bedding, clothes and other articles.

The workmen themselves were brought in over the snow before the spring breakup of ice. The workers were mostly Belgians, Finns, Russians and Swedes. Each man was an individual contractor, working under subcontract from the construction company. Sometimes eight or ten would band together, buy a tent and food supplies in common, and take a contract for a mile of grading.

The workers who went in last spring and spent eight or nine months in the north, averaged $5 to $6 a day above their expenses. To do that, though, they worked sixteen, eighteen and even, in some exceptional cases, as much as twenty hours a day, which is easier to do in a land where the sun sets around eleven o'clock at night and rises about 1:30 in the morning.

The Hudson bay railroad differs from all others not only because of the difficulties overcome, but in the way the work was done. For one thing, there was neither liquor nor camp followers in the north. In a land where every pound of food is freighted in at immense cost, camp followers, sight-seers and other visitors are not wanted, and the Royal Canadian Mounted Police established a liquor deadline at the Saskatchewan river, at the edge of The Pas. Manitoba has government liquor stores, the one farthest north being at The Pas, but all the northern part of the province is unsurveyed crown land, not yet opened to homesteaders, and here the rule of the red-coated mounties is the law.

The ministry of railroads itself controls three miles on

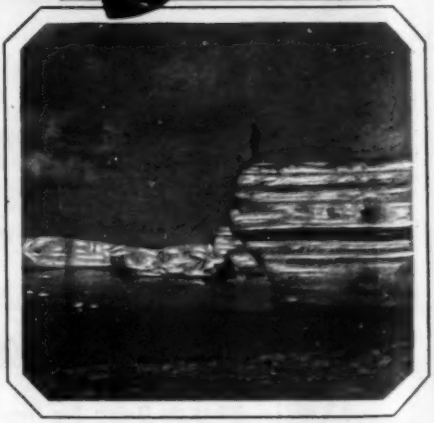


Placing Steel Beams of the Limestone River Bridge; a Sled Load of Duck Boards for the "Front Line," and, at Bottom, a Modern Ditching Machine

Cache North of the Nelson River; Sixty Tons of Supplies Were Placed Ten Miles Apart to Last through the Summer

Flying Boat Loading Supplies to Be Flown to Fort Churchill; the Air Patrol Also Has Charted Ice Conditions in Hudson Bay and in the Straits Every Day for More than a Year

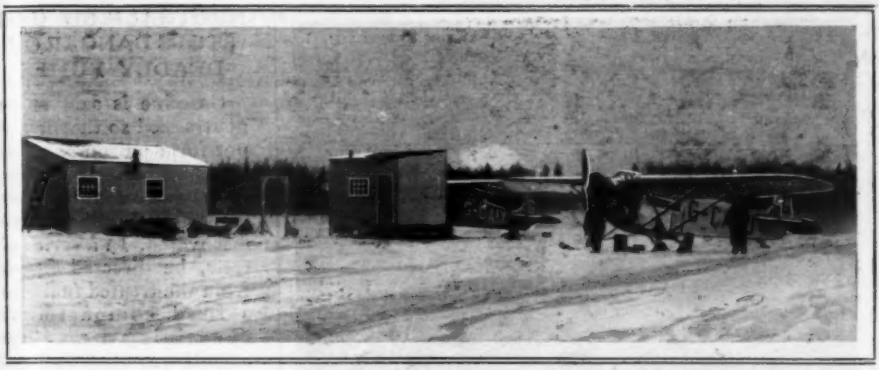
Where the Hudson Bay Road Crosses the Nelson River, at Kettle Rapids, One of Many Potential Sites Which Some Day May Develop a Vast Supply of Electrical Energy



Group of Railroad Engineers beside Their Office Car; Scene at Fort Churchill, on the Bay, and the Break-Up of the Ice at Big Limestone Rapids on the Nelson

either side of the Hudson bay line, and not even a trader can build a store along the right of way without a permit from the engineers, who fix the site and control the operations of the storekeepers.

The north country probably will not be ready to welcome tourists and settlers before 1930, as all the coming summer will be required to get the final miles of railroad in shape for traffic. Maj. J. G. MacLachlan, the engineer in charge at The Pas, and Claude Johnson, his assistant at the end of steel, plan a steel-laying drive over the snow this winter. The road reached the edge of the Barrens in the late fall, and from there north steel was pushed ahead on the frozen ground without any grading. Work was discontinued December 15, at Mile 442, but will start again on March 15, in an effort to reach Fort Churchill two months later. From about Mile 420, north of The Pas, to within three miles of the terminus, at Mile 512, in Churchill, the route lies over the Barrens. Churchill itself will be a deep-sea port within a few months. A vast quantity of material gathered at Port Nelson nearly fifteen years ago has been moved 150 miles up the



Freighting of the Railroad Is Largely Done by Air; in Winter, Portable Houses on Sled Runners Are Pulled over the Engines, to Keep Them Warm and Enable Mechanics to Work

bay; dredges and tugs brought around from the St. Lawrence, temporary docks built, and, probably during the coming summer, work will be started on the grain elevators.

Churchill is a natural harbor, with a narrow entrance between rocky headlands, one of which is crowned by the eight-foot-thick stone walls of ruined Fort Prince of Wales, and the other by the ruins of Merrey Battery, both noted defenses in the early days when all the Hudson's Bay company posts in the northland drew their supplies through the rivers leading west and south from the bay.

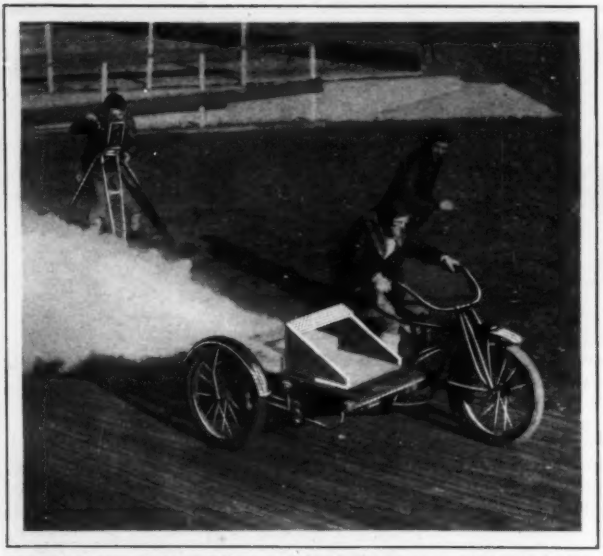
There is a Hudson's Bay company whaling station at Churchill, a Canadian Mounted Police barracks, and there was a settlement of traders and others on privately owned land. When it was decided to make Churchill the railroad terminus, the government expropriated all the private lands on the port side of the harbor to keep speculators out. The Canadian parliament is considering some form of town development which will eliminate private ownership entirely, and limit settlers to those actually needed at the port.

Built primarily as a wheat carrier, the railroad is opening up not only a sportsman's paradise, but a vast mineral belt. Last summer a ninety-mile branch was pushed through to the Flin Flon mines, where New York capitalists are spending $30,000,000 to develop a great deposit of copper, zinc, lead and gold. A few miles away, $10,000,000 is being spent on development of the Sherritt-Gordon mines.

Gasoline played a big part in the building of the Flin Flon branch last winter and spring, and is again playing a big part in the drive to Churchill. The ninety-mile branch was built in just eight months. To make it possible, all supplies were freighted in over the snow. Huge tractors, capable of carrying eight tons of freight on their own bodies while hauling a string of loaded sleds, were used. A tractor train averaged from forty to sixty tons at a load, and made a round trip of 120 miles in from seventeen to eighteen hours. The motors never stopped, running day and night.

Contrary to the accepted belief, the weather is not particularly bad in the north, and the camper and tourist season may stretch into the middle of October. There is little snow up to that time, and even at the edge of the Barrens, overcoats are not necessary, a wool shirt and "windbreaker" being enough for comfort. At Mile 352, beside the Big Limestone rapids of the Nelson, some forty miles west of Port Nelson, on the bay, the temperature chart for the last year showed forty-six below zero on Dec. 9, 1927, and thirty-eight below on January 13 and February 2—the only three really cold spells. On the other hand, the thermometer reached seventy-eight above as early as May 12, eighty-eight on May 24, ninety-two on June 6, and ninety-two and a half July 9.

For a month or six weeks, man-eating flies and mosquitoes make life miserable, but the fly season is usually over by the end of July, and headnets and tents can be discarded.



Testing Motorcycle Propelled on the Rocket Principle; Fuel Supply Is Carried in the Sidecar Rack

MOTORCYCLE RUN BY ROCKETS PLANNED FOR HIGH SPEED

Interesting tests with a motorcycle propelled on the rocket principle, developed in Germany, have been made in New York by an American inventor. He hopes to attain a greater speed than is possible with existing types of cycles. One of the disadvantages of the idea, which, engineers assert, will have to be overcome before the rocket principle can be used satisfactorily in everyday life, is the large volume of smoke developed. Improvements to insure greater safety are also necessary.

HEAT PROCESS TO RECOVER OIL FROM SAND STRATA

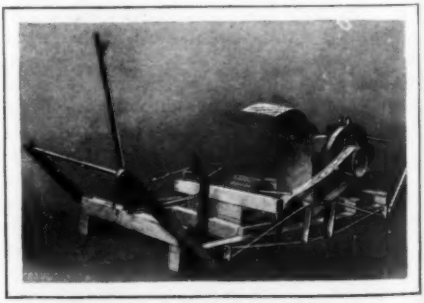
To obtain greater quantities of oil from sand that has been drained by usual methods, Ben E. Lindly, of the bureau of mines, has proposed to subject the strata to heated natural gas under pressure. His idea is based on the theory that, if the oil is raised to a high temperature, virtually all of it can be vaporized and forced out of the sand. According to his findings, not more than fifteen per cent of the oil is recovered by present methods.

NEUTRALIZED GAS STOPS DANGER OF DEADLY FUMES

Gasoline is said to be neutralized so that it will not form poison gases at the automobile exhaust by a process an Illinois man is reported to have discovered. In a series of tests, he directed fumes from the treated fuel into a small compartment containing a rat. The animal was alive and apparently none the worse for its experience after forty minutes' exposure to vapors from the treated gasoline, while another rat was killed in a little more than two minutes after breathing fumes from ordinary gasoline burned in an engine. The treated fuel is said to give as much power as the usual kind, does not injure the motor, and is even said to give the engine a little quicker pick-up.

WAVES IN CONCRETE PAVEMENT REMOVED WITH CUTTER

Waves and other irregularities in the surface of concrete pavements are removed with a rotary cutter that has 342 steel wheels which dress the material down to a depth of half an inch or more. The smoother is moved along the highway on casters, grinding and cutting as it goes.



Rotary Cutter with Many Steel Wheels Used to Smooth Out Irregularities on Concrete

SEA ANIMALS PRODUCE MOSS TO DECORATE HATS

For years, most of the sea moss used to decorate hats, and for similar purposes, was imported, but fishermen have discovered a closer source of supply in Chesapeake bay, where superior varieties are found in water from ninety to 150 feet deep. In reality, the material is not moss but a plantlike growth formed by tiny animals. It is torn from the rocks, shells and other objects to which it becomes attached, saturated with a nondrying substance that keeps it from becoming hard and brittle, and is then dyed and combined with artificial flowers.

OUTBOARD MOTORBOAT RACERS TO HAVE OWN TRACK

English outboard motorboat racers are to have their own private speed track as the result of the purchase of a lake for their exclusive use. A grandstand seating 5,000 people, refreshment stands, automobile parking space, marine garage and slipways are to be established, and a branch canal dug to connect the lake with a near-by navigable canal, which links with an extensive system of rivers and canals, so motorboats from distant points can come direct to the race track by water.

SMALL SAFE CARRIED IN AUTO GUARDS LICENSE PAPERS

Jewels, small articles of many kinds and auto license and registration papers or club cards are effectively protected in a small combination safe that may be attached to any convenient place inside the car. It is attractively nickelplated on heavy brass and cannot be opened unless the combination is known.

¶Groundhogs are sometimes found as far north as the Arctic.

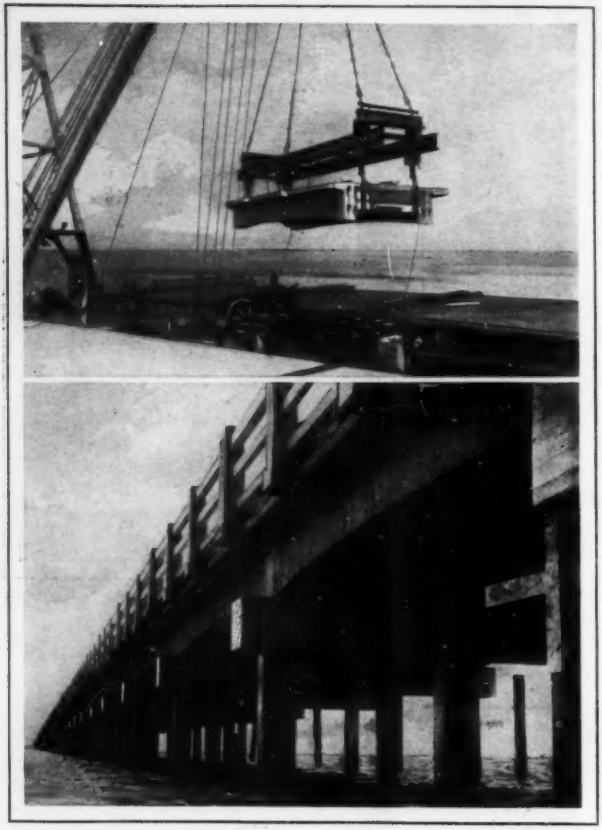
Tying Bundles of Celery with Rubber Bands Prepared from Inner Tubes

PACKAGE TYER USES BANDS CUT FROM INNER TUBES

Bundles of celery and similar articles are quickly tied with rubber bands cut from inner tubes. The bands do not cut or otherwise injure the celery and can be adjusted in a fraction of the time required for tying a package with string by hand.

BOTTLE DRIFTS MANY MILES ON OCEAN CURRENTS

One of the longest "bottle voyages" ever recorded has just been entered in the finding of a bottle on the shore of a small island near Japan. According to the form it contained, the phial was thrown from a ship about 250 miles west of Mexico, Nov. 14, 1926. It has thus traveled at least 6,500 miles, according to the drift of the ocean currents, and probably much farther. These bottles are set adrift by the hydrographic office with instructions that the finder return the paper inside after it has been marked to tell the place and date of its recovery, so that data may be obtained as to the direction and speed of the sea currents.



Swinging a Load of Bridge Sections into Place, and View of Part of the Structure, Showing Method of Assembly

BRIDGE IS BUILT IN SECTIONS OF PRECAST CONCRETE

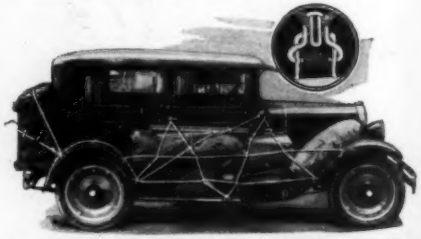
To save time in constructing the long concrete bridge across San Francisco bay from Mt. Eden to San Mateo, deck sections, piles, roadway curb, handrails and other portions are being precast and then assembled after being shipped from the casting plant in barges. Thirty days are allowed for the piles to dry and eleven for the deck sections. More than 300 men are employed in the casting operations. In all, 1,100 precast deck sections, each thirty feet long and weighing forty-six tons, and 232 sections, thirty-five feet long and weighing fifty-five tons each, will be needed. For the entire project, which will cost $7,500,000, 79,000 cubic yards of concrete, 10,000 tons of reinforcing steel and 2,500,000 feet of lumber for the forms will be required.

MIXED COAL DUST AND CEMENT FOR FUEL

Small blocks of coal dust, mixed with cement to hold the grains together, have been prepared by a western company as a way of utilizing coal too small for sale. Only two bags of cement are used to a ton of coal, and as little water as possible. The briquets are pressed in molds and each weighs about five pounds. They are said to burn readily and leave but little ash.

CLAMPS HOLD AUTO LUGGAGE ON CAR ANYWHERE

To tie luggage securely to the automobile, clamps, padded with rubber to prevent scratching the car, are quickly adjusted to the running board, fender or other parts. They provide ties for the ropes that may be woven about the load to hold it on. The clamps are easily put on or taken off, and as many may be used as is necessary. Since several may be employed at once, secure roping of the load and distribution of strain are possible.



Ropes Tied to Clamps and about Luggage, and Close View of One of the Clamps

RUBBER TOP PROTECTS TABLE AND HELPS REDUCE NOISE

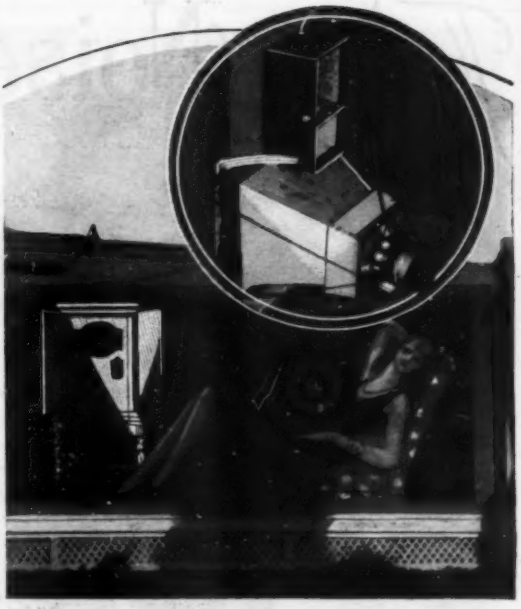
Adapted especially for a kitchen breakfast table, a rubber top, that slips over the edges and snaps into a groove on the underside, makes it easy to keep the table clean, stops noise and also protects the dishes. The corners are reinforced, and the top edges of the leaves and the center of the table are slightly raised to prevent spilled liquids from running off, thus guarding the floor. The table also has rubber tips on the legs.

NATURAL LIGHTING AIDS SARDINE FISHERS

Night is the best time for sardine fishing, for it is then easier to locate the fish. In swimming through the water, they disturb myriads of microscopic organisms which glow like fireflies and so enable the fishers to detect the presence of their prize. Along the California coast, a special net is used to take advantage of the phosphorescent glow. Its center is of extremely fine mesh, but the borders are much coarser to make it easier to haul. The fish are frightened to the center of the net, where they cannot escape, by the glow on the water.

TOOL ROUGHENS TYPEWRITER ROLL TO PREVENT SLIP

When the rubber on the typewriter roller wears so smooth that the paper slips, it is easily roughened with a small buffer that does not injure the material. The unit is furnished in three sizes for different makes of machines, and is curved to fit the rollers evenly and effectively.



Signboard as It Appears from the Street, and Close View of the Loud Speaker Concealed behind the Cabinet

RADIO SIGNBOARD THAT TALKS WORKS AUTOMATICALLY

An outdoor signboard, advertising radio equipment, has been made doubly effective by installing a dynamic speaker behind the painting of a cabinet. Radio and phonograph programs are broadcast through it at different times of the day, an automatic timing device turning the set, which like the speaker is concealed, on and off without the need of an attendant. The representation of the cabinet is outlined by means of neon-gas light tubes to attract further attention.

PAPER DETECTS GAS LEAKS TO AVOID ACCIDENTS

Testing house pipes and street mains for gas leaks is expected to be safer and more effective with the aid of a specially prepared, sensitive paper. It is of an absorbent variety like filter or litmus paper, and is chemically treated so that when a flow of gas comes in contact with it, its color is conspicuously changed.

The Art of Noise Making

Reproducing the Squeaking of a Train's Brakes from Off-Stage by Drawing a Pair of Tumblers across a Sheet of Plate Glass; One of the Effects in a New German Play

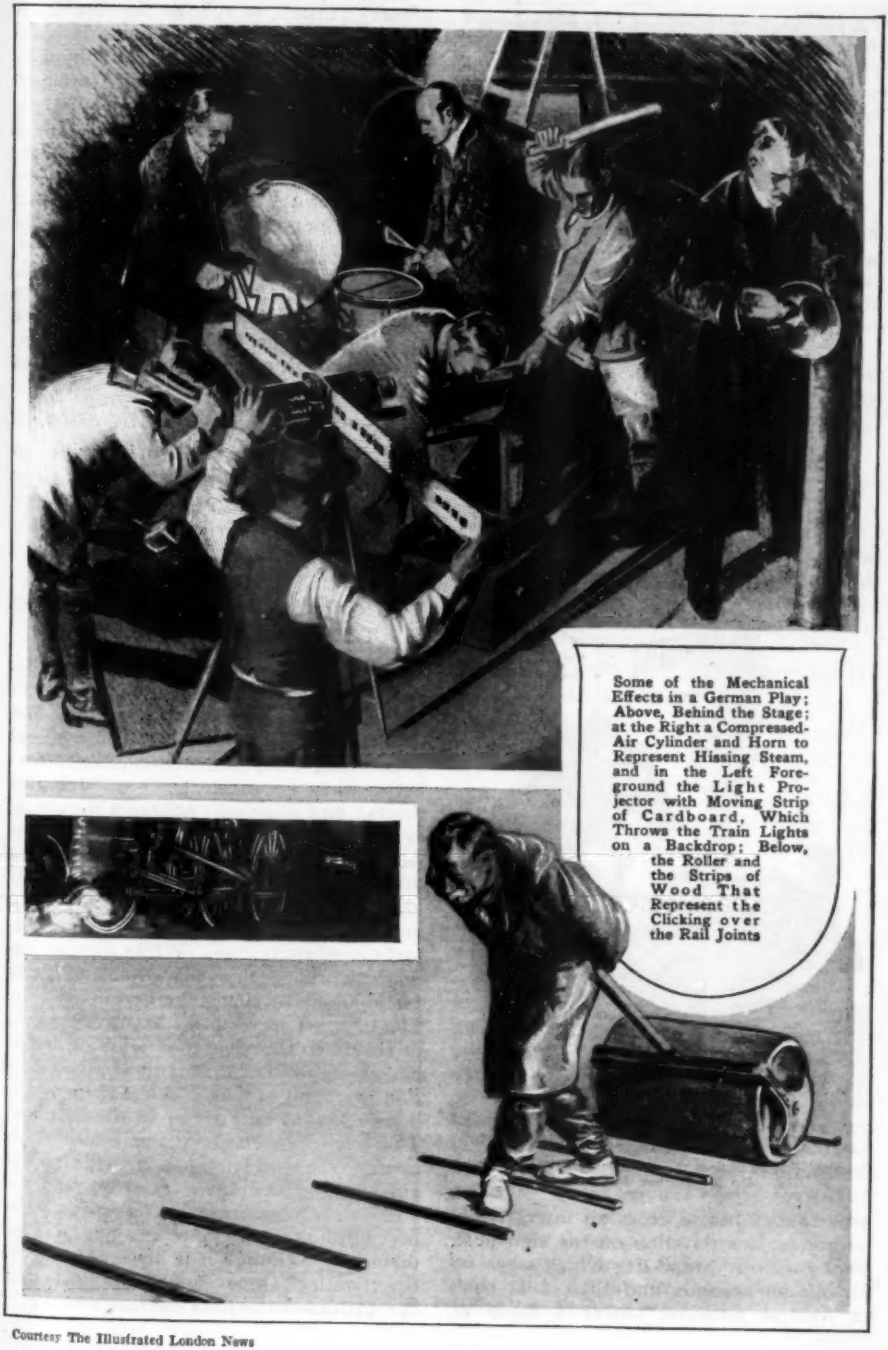
MAKING realistic sounds for the talking movies, the radio and the mystery plays of the stage is rapidly becoming both an art and a profession. The rise of a radio-play broadcast, calling for a variety of noises, focused attention several years ago on the fact that what goes into a microphone isn't always the same thing as what comes out of the reproducer at the other end.

The radio-play producers were mostly concerned with opening and closing doors to signal the arrival or departure of an unseen actor, with pistol shots, thunder, lightning, footsteps and the rustling of papers—all more or less simple noises.

The talking movies, however, are troubled not only to produce the realistic sounds they want, but to keep from producing the sounds they don't want. A heroine, for example, can't faint in a taffeta-silk dress, because taffeta silk is altogether too noisy. She must wear crepe de Chine to do her fainting in. A dancer can't wear a pearl or bead-bedecked frock, for every swish of such a dress would sound something like a violent hailstorm on a tin roof.

The trouble of sound in the films lies in the distortion of the noises in the electrical apparatus. Most talkies so far have lisped—their most noticeable defect. The reason for the lisp is the fact that the letter "S" is a high-frequency sound; in other words, one of extremely short wavelength. "O"on the other hand is a low-frequency note, of long wave and easy to reproduce.

The same electrical reason that makes the letter "S" difficult to reproduce is behind all the trouble in finding the wrong sound to reproduce the right effect. Roy J. Pomeroy, sound expert of the Paramount-Famous Players-Lasky studios, describes one typical difficulty. In the film "Varsity," Chester Conklin was required to rustle a newspaper. To the people of



Some of the Mechanical Effects in a German Play; Above, Behind the Stage; at the Right a Compressed-Air Cylinder and Horn to Represent Hissing Steam, and in the Left Foreground the Light Projector with Moving Strip of Cardboard, Which Throws the Train Lights on a Backdrop; Below, the Roller and the Strips of Wood That Represent the Clicking over the Rail Joints

Courtesy The Illustrated London News

the studio it sounded quite natural, of course, for he just rustled the paper. But when the sound came back from the recording apparatus, the newspaper sounded like a machine gun in rapid fire. Mr. Pomeroy experimented until he discovered that the correct way to rustle a newspaper for the talkies is first to wet your paper.

A police whistle gives the same trouble, in a different way, as the letter "S." It is far too piercing for the reproducing apparatus to handle. Sometimes a soprano's high note, on your radio, "freezes" the diaphragm of the reproducing unit. That's what the police whistle did to the sound recorder. Mr. Pomeroy solves the problem by putting the whistle blower behind a heavy curtain, to subdue the sound. A fire-engine siren had to be similarly blanketed to get it down to the right volume.

In a recent play produced in Germany, "The Phantom Train," all the off-stage sounds of a train were made by a half dozen men, using the ordinary stage-sound equipment. The clicking of the wheels over the rail joints was imitated by a man dragging a heavy garden roller over a series of cleats nailed to the floor, each little bump being one rail-joint click. The screech of brakes came from two tumblers rubbed over a sheet of plate glass. A cylinder of compressed air, released through a megaphone, represented escaping steam.

PUSH-BUTTON TRAFFIC SIGN AIDS PEDESTRIANS

Pedestrians act as their own traffic police with the aid of a press-button street signal introduced in Los Angeles. When

Pressing Button Raises the "Stop" Flag, Which Stays Up for Fifteen Seconds

a person wishes to cross an intersection, he presses a little knob on the sign post. That raises a "Stop" flag which stays up for fifteen seconds and then falls back to neutral position. After a lapse of twenty-five seconds the signal may be operated again for another pedestrian. The device is intended especially for intersections where the traffic is intermittently light and heavy.

GUARD MYSTERY DIAMOND MINE TO PREVENT SMUGGLING

Workers in one of the more recently developed diamond mines in South Africa are confined in a barbed-wire inclosure which they cannot leave except by official permission. They must remove their shoes before they go to meals or off duty for the day, and those who help sort the gravel at the final washing are not allowed to put their hands in their pockets. These, and other stringent regulations have been established to prevent smuggling the gems out of the field. The area is an exceedingly productive one. While digging recently, workers removed a stone and found 148 diamonds lying together in a heap. The greatest secrecy has been maintained in regard to the yield of the mines, but it has been reported that if the full production were immediately released for sale, it would result in a slump in the industry. The mine is owned by the South African government and will provide profitable yields for at least fifteen years, according to engineers. In spite of all the precautions taken, there is smuggling of diamonds, although it is believed some of the "bootleg" stones come from fields that the natives themselves operate secretly.

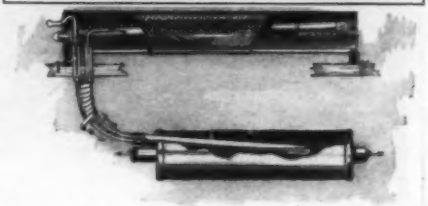
WONDERS OF MODERN HOTELS SHOWN AT EXPOSITION

Machines that wash 25,000 dishes an hour, cash registers that can ring up $9,000,000, electric toasters that can brown 900 pieces of bread in an hour—these and many other marvels were shown in New York recently to illustrate what goes on behind the scenes in a large modern hotel. Among the kitchen aids was a machine that shells a bushel of peas in three minutes and a mixer that prepares the ingredients for 1,200 loaves of bread in six to seven minutes. A washing machine cleans a bushel and a half of vegetables in one and a half minutes.

RANGE GUN FIRES STEEL BALLS IN TARGET PRACTICE

A range gun to be used in teaching gun laying and pointing has been invented by Capt. E. H. Stillman, assistant professor of military science and tactics at the University of California. The gun, a wooden affair worked by a spring, fires quarter-inch steel bearing balls. The spring tension is so adjusted that one inch on the range used equals fifty yards. The steel projectiles fall on a sand table eight by fourteen feet in size, and tiny bursts of sand mark the shell puts. Small wooden model battleships are used for targets, on ranges equivalent to 24,000 yards. A small screw controls the muzzle velocity, and trajectory, firing tables and probable error of the miniature gun are almost the same as for a modern fourteen-inch coast defense gun, and it cost less than $1.50 to build.

Wooden Gun That Fires Steel Bearing Balls, to Aid in Target Practice at Less Expense



Automobile Heater Installed, and Drawing to Show Its Construction and Method of Connection

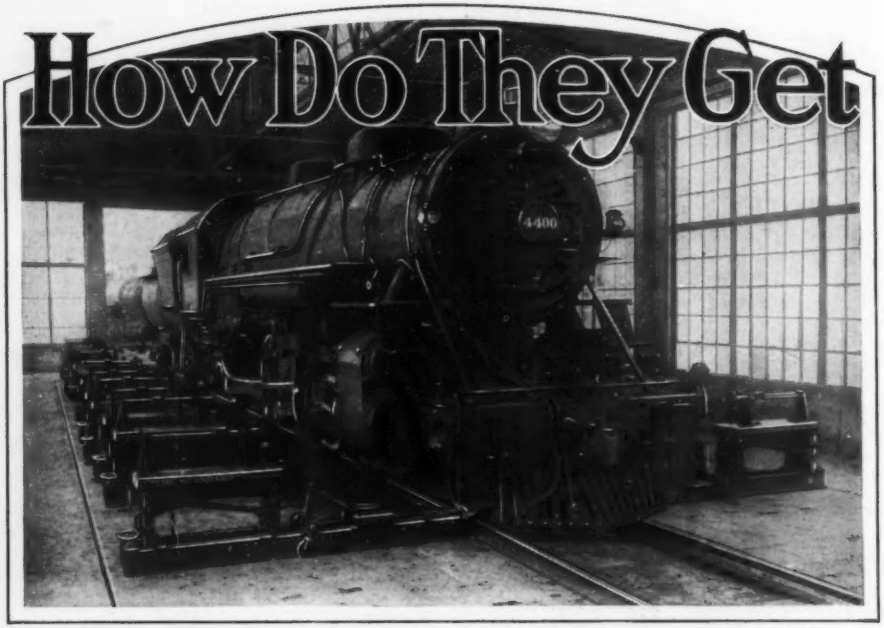
STEAM-HEAT SYSTEM FOR AUTO EASILY INSTALLED

Steam from a special liquid is produced by the exhaust heat in a warming system for the interior of the car, easily installed and capable of regulation simply by turning a small knob. It fits close to the back seat, gives off no fumes or odors and requires but little attention.

LOST ISLAND IN SOUTH PACIFIC SOUGHT FOR EIGHTY YEARS

For nearly eighty years, mariners have told of a mysterious island, a lonely reef-guarded spot in the south Pacific, first reported in 1859, a year before the United States sailing vessel "Levant" disappeared on her way from Hilo to Panama. It is believed that the ship may have searched for the island, as her officers had talked with merchant captains about its probable location. Some persons regard the island as a myth. Others believe that it may be one of the floating islands not uncommon in tropical waters, and still others hold that it lies so low in the seas that it is difficult to find.

How Do They Get



Weighing a New Locomotive in the Shops of the Baldwin Locomotive Company, at Philadelphia; Separate Track Sections and Scales Catch the Weight on Various Parts

A SECTION of steel railroad rail, several feet long, some six inches high and weighing ninety pounds to the yard, is mounted in a new museum in New York. The visitor is invited to push the rail and see how far he can bend it. He presses a button and looks in an eyepiece which discloses a series of light-interference rings. As he pushes, the interference fringes increase in number. A man of average strength can bend the huge rail as much as the width of seven or eight light waves.

That is something new in weighing, a demonstration of a process that may revolutionize the science of obtaining the exact weight of infinitesimal objects. A good laboratory precision scale will weigh a lead-pencil mark on a sheet of paper, but a weighing mechanism so delicate it can measure the force exerted by the human hand against a huge steel rail is so unbelievably delicate and sensitive that it can be used, perhaps, to measure the activity of an unseen atom.

Scales of all kinds, regardless of type, are alike in one thing, for they all are basically systems of measurement in which a fixed proportion is used to determine quantities. This is true regardless of whether the fixed proportion is the tension of a spring, a weight of predetermined size, or the deflection of a beam of light. But what the average scale user knows about weighing mechanisms, and what the experts of the bureau of standards and the department of agriculture know are different things entirely.

For example, sensitivity is not a sign of accuracy, popular belief to the contrary, for an extremely sensitive scale may be far from accurate, according to C. A. Briggs, government expert. Nor is accuracy a sign of correctness or inaccuracy a sign the scale will weigh wrong, for, paradoxical as it may seem, an accurate scale can be made to weigh wrong, and one that is way off in its weighing can be used in such a manner as to give a fairly accurate result.

When the butcher of popular legend rests a finger on the scale pan while weighing out the roast, he may or he may not be playing fair, for it is quite possible

That Weight?

according to Mr. Briggs, to poise a finger against the scale without affecting the result, and just as possible to exert pressure without betraying it.

There are countless curious and little-known facts about scales which the government experts are trying to clear up. They come in such a variety of sizes—from laboratory instruments that weigh the millionth part of a thousandth of a gram to track scales that weigh an 800,000-pound locomotive—and are used in such a variety of ways that keeping them accurate presents a real problem. The only means of telling whether a scale is maintaining its accuracy in use is to check it against a test weight which in turn has been checked with the master weights of the bureau of standards.

Comparing Home-Made Test Weight with Metal Standard, at Left, and, Above, the Final Accuracy Test

Test weights of known accuracy are rather valuable, so Mr. Briggs has invented a new form, which promises to bring down the cost of keeping scales accurate. His new test weight is simply a bottle filled with lead shot and sealed with cork and sealing wax. A set of such test weights, calibrated to check with the government standards, has varied less than one grain per pound in two years of use. When it is remembered there are 7,000 grains in a pound, the accuracy of these bottle weights is apparent.

Anyone with access to a standard weight can make his own bottle weights by filling a container with shot or nails until it balances the standard. The cork and enough sealing wax to seal it are placed on the pan during the filling of the bottle, and the wax then melted into place. By changing the quantity of wax, an accurate final balance can be made, either adding or scraping off a bit of wax as required. As most platform balance scales in use employ cast-iron weights, which become nicked and battered with use, they require periodical checking against test weights to insure accuracy.

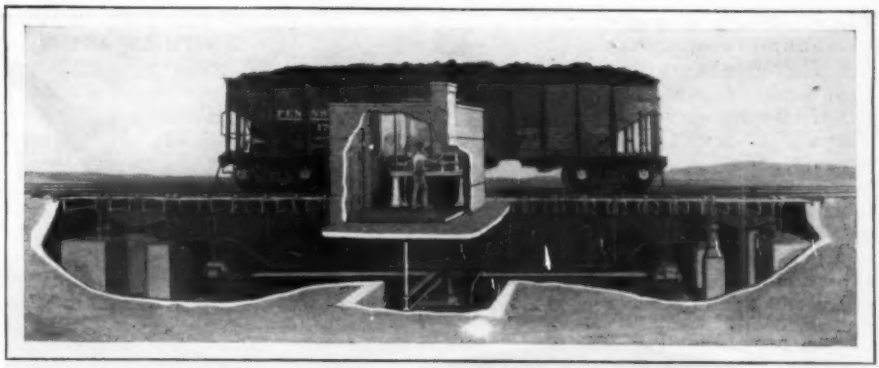
Weighing Diamonds with a Precise Type of Jewelers' Scales; Accurate Weighing Is Usually Done with Balance-Type Scales

It is a fact, Mr. Briggs points out, that an accurate weight can be obtained from an inaccurate scale, if occasion demands it. The system is known as substitution weighing. A large scale, used for weighing heavy objects, will not be accurate normally if used to measure small masses. To get around that drawback, a container, such as a bucket, can be placed on the platform and a weight equal to the amount to be weighed placed in it, and the lever balanced accurately. The weight is then carefully removed, without changing the position of the container, and the latter filled with the material to be measured, until the lever is again balanced. As the errors of the scale, whatever they may be, are constant, the substitution has produced an accurate weight.

Did you ever hear of weighing a heavy object in sections on a scale too small to weigh all of it at once? That is done regularly in checking the weight of motor trucks to determine whether they are loaded past the limit allowed on modern highways. The highway inspector carries one or two small scales which are placed under the rear wheels of the truck. If only one is used, a dummy block, the same height as the scale, is placed under the opposite wheel, to avoid disturbing the center of load. Of course there is a slight shifting of the fore-and-aft load center when only the rear wheels are elevated, but, as the wheel base is considerably longer than the tread of a car, the shifting is not as great as it would be if only one rear wheel was elevated at a time.

If all four wheels are placed on scales simultaneously, the combined weight shown by the four scales would be an accurate total for the truck and its load. Locomotives are weighed in much the same way in the builder's plant to determine the proportion of weight on pilot wheels, driving wheels and trailing truck. Each group of wheels rests on a separate track section built on a scale platform. A similar system is used in weighing airplanes at the army experimental field at Dayton. Three platform scales are used, two under the landing wheels and one under the tail, the combined weight on the three being the total for the plane.

Weighing has been adapted to industry and merchandizing in some peculiar ways. In the big mail-order houses and department stores the orders received during the day or the day's sales checks are placed on scales and weighed. Knowing the weight of a given number of such slips of paper, a close count of the total volume can be obtained in an instant by weighing. Also, as the law of averages shows the average order or sale will be about a given sum, it is possible to estimate the day's business, in dollars and cents, by weighing the sales checks or order blanks, find-



Weighing a Car Load of Coal on the Giant Balance of a Pennsylvania Railroad Fulcrum Track Scale; the Cut-Away Scale House Shows the Operator Adjusting the Balance

ing the approximate total number and multiplying it by the average size of a sale in the past.

Similarly, factories using large quantities of small parts, such as screws, or stores selling such small parts in quantities, habitually use scales to count them. Knowing the weight of a given number of the objects to be counted, it is easy to count any multiple of that number by weighing them. Or, with a balance, it is possible to get a direct count by placing a known number in one pan, and balancing them against a larger number in the other. With a ten-to-one balance arm, ten of the objects in the pan of the long arm will balance 100 in the opposite pan, and the hundred, shifted to the other side, will then balance a thousand, and so on.

Railroads are one of the largest users of scales, and the users of the largest scales, in the country. The plum for size goes to the new track scale of the Pennsylvania railroad at Altoona, which can weigh an 800,000-pound locomotive, when one is built. So far, the biggest locomotive weighed on it tipped the beam at 613,000 pounds. Scales are of importance in the operation of a railroad because all its freight revenue is calculated by them. The Pennsylvania handled 230,000,000 tons of freight in 1926, a measuring operation that required 6,000 scales, including 250 track scales for weighing entire cars with their loads. The 6,000 scales determine a revenue of well over a half billion dollars in normal years, and one track scale in the Juniata yard at Altoona fixes freight charges of about $50,000,000 annually.

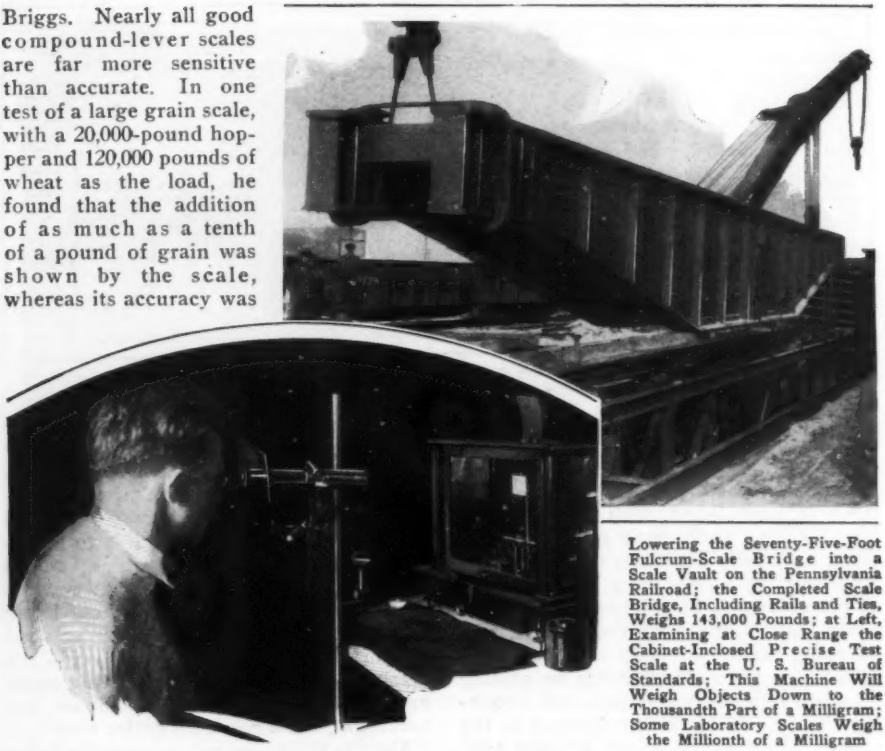
To keep so many scales accurate is a big task. The railroad companies employ one master scale, which is checked at frequent intervals against government standards. On this scale test cars are weighed and then sent out over the line to be reweighed on the other track scales. Freight cars are weighed on the track scales while in motion, the weight of each car being caught as the train passes over the scale platform. In one of the busier yards, the track scale has a record of having averaged one and a half cars every minute, day and night, throughout an entire month.

Despite their tremendous capacity, these track scales are so accurate that they can determine the weight of a person within five pounds. In some yards humps have been installed to start the cars down by gravity over the scale platform. A locomotive pushes a train to the top of the hump, and then, one by one, the cars roll down to the weighing track. In order that the cars may always pass over the platform at a uniform speed, to which the scale is adjusted, the hump is built so it can be raised and lowered at different seasons of the year.

Jewelers' scales have always been supposed to be very accurate. Actually they may not be, according to A. T. Pienkowsky, one of the scale experts of the bureau of standards. The value of a precious stone would hardly be changed if the scale was wrong by as much as a fraction of one per cent, he points out.

The relation of sensitiveness to accuracy, or rather the lack of their relation, is easily demonstrated, according to Mr.

Briggs. Nearly all good compound-lever scales are far more sensitive than accurate. In one test of a large grain scale, with a 20,000-pound hopper and 120,000 pounds of wheat as the load, he found that the addition of as much as a tenth of a pound of grain was shown by the scale, whereas its accuracy was no greater than an error of twenty pounds in 120,000. There was a ratio of 200 to one in the relation of sensitiveness to accuracy, yet there could just as easily have been an error of 400 pounds in the scale without affecting its sensitiveness.



Lowering the Seventy-Five-Foot Fulcrum-Scale Bridge into a Scale Vault on the Pennsylvania Railroad; the Completed Scale Bridge, Including Rails and Ties, Weighs 143,000 Pounds; at Left, Examining at Close Range the Cabinet-Inclosed Precise Test Scale at the U. S. Bureau of Standards; This Machine Will Weigh Objects Down to the Thousandth Part of a Milligram; Some Laboratory Scales Weigh the Millionth of a Milligram

MACHINE FOR PAPERING WALLS REQUIRES LITTLE SKILL

With the aid of a roller machine that applies paste and lays paper on the wall or ceiling, even a novice can paper a room, according to the manufacturers. After the paste is put on with revolving brushes in the machine, soft rubber rollers press the strip firmly to the wall. Only a few adjustments are needed for ceiling work, and the unit has handles at the top for easy manipulation. Before applying, the paper is threaded into the machine.

HOW HEAT AFFECTS TREES

That the rate of growth and the survival of forest areas are largely dependent upon the temperature, has been established in a series of interesting tests performed in northern Idaho. Seedlings of the western yellow pine, gathered from twenty-one localities, were planted and careful measurements made as to their growth in the experimental area. Some lots grew slowly, while others developed five or six times as rapidly. Soil and other conditions were the same for all, the temperature evidently being the determining factor in speeding or delaying the growth.

STRAIGHT-LINED SHIPS REDUCE SEASICKNESS

Ships with berth cabins and public rooms designed on straight lines, like those on shore, are less likely to cause seasickness than those where slightly curved lines prevail. At least, such seems to be the experience of a British railway company with two cross-channel vessels, exact duplicates, except that one was constructed in the ordinary manner with cambered decks, state-room bulkheads and other partitions following the form of the ship's sides, while the other had flat decks and partitions at right angles throughout. This ship proved to be more popular with the traveling public, and it was intimated that the reason was that seasickness was less frequent among persons occupying the square, flat-topped and flat-floored rooms. The explanation was that such lines had a less irritating effect upon the mind, while the irregular lines, in some cases, annoyed the observer and so helped upset his physical well-being, although unaware of the real source of his irritation. In support of this theory is the well-authenticated report of a hardy foreman on a railroad who became ill after only fifteen minutes' work in a baggage car that had been tipped at a slight angle during a wreck. Several other members of the crew were affected in the same manner. The out-of-plumb lines evidently helped cause nausea.

¶The Cuban humming bird is the world's smallest bird.

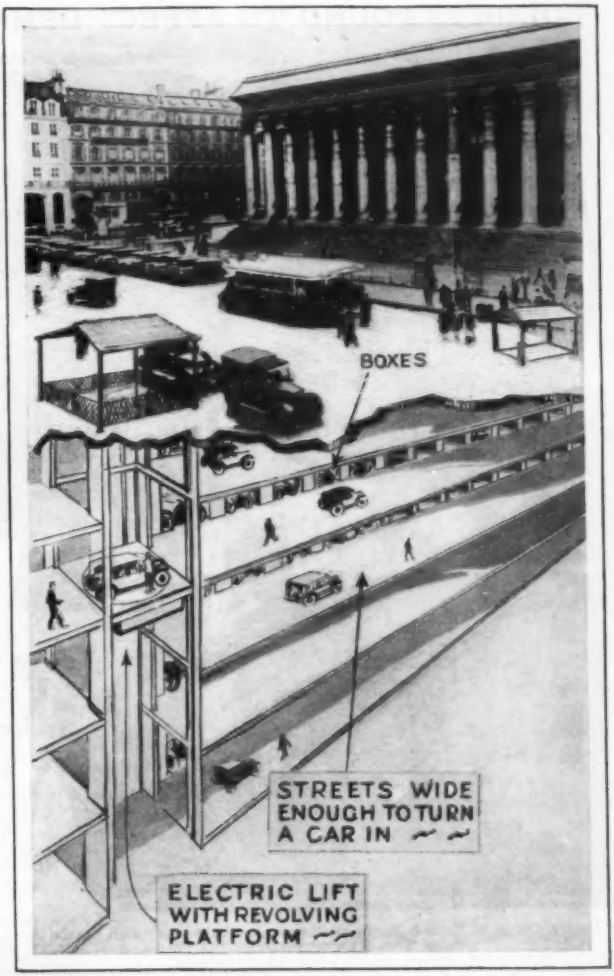


Photo-Diagram Showing How Paris Traffic Authorities Are Planning to Solve the Auto-Parking Problem in Busy Streets

PLAN UNDERGROUND AUTO PARK TO RELIEVE PARIS TRAFFIC

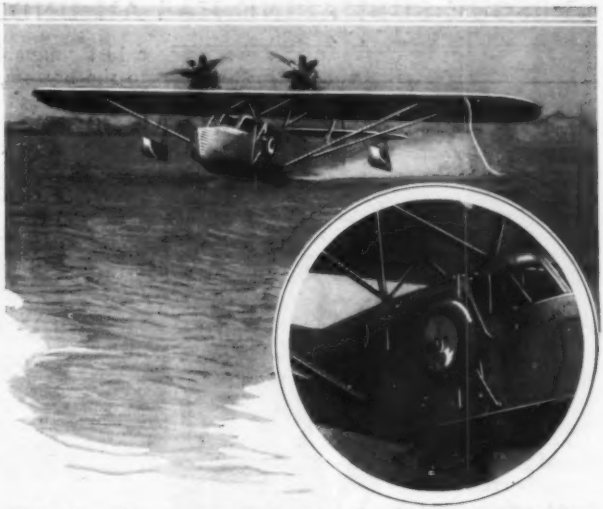
Thousands of cars will be parked under the streets beneath the Place de la Bourse in Paris, if present plans materialize. A shaft for an electric lift will be sunk many feet below the surface and the autos parked in substreets at various levels. The passageways are wide enough for a car to be turned around, and will be thoroughly ventilated to eliminate fumes from the exhaust.

COLOR IS FOUND TO AFFECT DEMAND FOR FOODS

Testing Colors of Various Foods in Government Laboratory with Special Apparatus That Exactly Measures the Shades

The color fad has struck the food industries. Consumers, it has been learned, have preferences for color in their foods as in house furnishings, clothing and automobiles. They want solid colors in the things they eat; red tomatoes, white corn, red apples for eating raw and green apples for cooking, purple grapes, yellow squash, meats with a deep-red coloring. As a result, studies are now being made by the department of agriculture to measure the color elements in farm products. Specially designed color apparatus is used to determine precisely the various tones of color in foods, such as apples, tomatoes, beans, peas, celery and other products. On the basis of these and similar studies, recommendations are made to producers for harvesting crops at a time calculated to place the products on the markets at the exact stage of maturity to bring out the desirable colors. Nothing is so discouraging to variety in the human diet, say the food specialists, as the washed-out appearance of soggy vegetables on the dinner table. In fact, prejudices against certain important vegetables are directly traceable to this cause. Preservation of the natural color goes hand in hand with proper cooking. The first is an appeal to the eye, the second tickles the palate, and both satisfy the requirements of the human body. Also, food quality standards have been issued by the department of agriculture for forty different fresh fruits and vegetables, meats, butter, eggs, poultry and canned tomatoes, corn and peas. It has been found that a food may be fit for consumption but is not necessarily of high quality. The consumer, to be sure, is not a food specialist and can

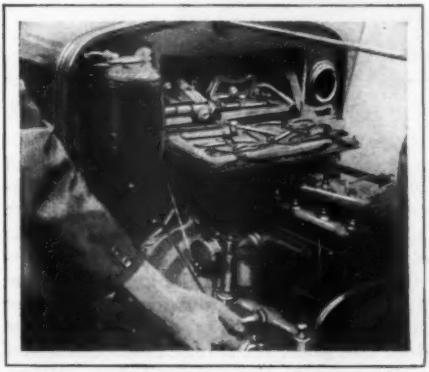
judge quality only according to whether a food is pleasing to the eye and palate. Canners' organizations are co-operating in this work to assist consumers in their purchases and to give assurance of uniformity in the quality of products, and as a result a system has been developed in which "Grade-A" corresponds to what is known as fancy; "Grade-B" to choice or extra standard and "Grade-C" to standard. The investigations have shown that high price is not always the equivalent of high quality. Thus, it was found in one of the tests that the highest-priced can was really second in quality, whereas a medium-priced can, nineteen cents cheaper than the highest-priced product, was of better quality.



Flying Boat Skimming over Water, and a Close View of the Cabin, Showing Landing Wheel Drawn Up on Side

DASHBOARD HOLDER FOR TOOLS SAVES TIME IN REPAIRS

Small tools for automobile repairs are quickly accessible in a convenient holder in the dashboard. The rack tips back on hinges, saving the task of lifting seat cushions, is easily installed, and holds the tools where they are not likely to jar loose.



Tool Kit Open for Easy Access; Its Installation Does Not Interfere with the Wiring

TWIN-MOTORED SEAPLANE HAS HIGH SPEED

A new type of amphibian plane, with twin motors mounted above the monoplane wing, in the manner of usual flying-boat practice, has been produced by a Detroit designer. The landing wheels are drawn up alongside the boat hull when not in use. Carrying six passengers, the ship, with two 150-horsepower motors, has a speed of 115 miles an hour.

ESKIMO ICE CREAM IS MADE FROM OIL OF FISH

Eskimos of Alaska have one unexpected winter dish, ice cream made from fish oil, snow and sugar. The dish has a strong odor, but tastes, it is claimed, better than it smells. The eulachon, a species of smelt, is also known as the candlefish, because it contains so much oil that it can be burned to furnish light. The Eskimos catch vast quantities of the fish, place them in holes lined with heated rocks, and, after they are cooked, press out the oil by putting the fish in a covered basket on which the women tread with bare feet. During cold weather, the oil has much the appearance and consistency of butter. To make the ice cream, it is melted, and sugar and snow then stirred in.

RESCUE SUBMARINE HAS AN UNDERWATER EXIT

A submarine designed to rescue trapped crews of other submarines is rapidly nearing completion at the Bridgeport yards of Simon Lake, famous submarine inventor and builder. The new craft, rebuilt from the little ninety-two-foot seven-inch submarine "Defender," produced by Lake in 1906, is shortly to be given a trial by the navy, working in conjunction with the recently rebuilt "S-4," which was sunk a year ago in a collision with the coast-guard destroyer "Paulding." As a memorial to the "S-4's" dead, the navy reconditioned the boat especially to carry out tests of submarine-rescue apparatus. The unique feature of the rebuilt "Defender," in which Lake and Capt. Sloan Danahower have collaborated, is an underwater exit door enabling divers to enter and leave the ship. The great difficulty in all rescue work in the past has been that the divers had to work from surface ships, which could only be anchored in fairly calm weather. With the new boat, the rescue crew can, after a lost submarine has been located, drop to the bottom, lie alongside the damaged hull, and send divers over to work or rescue the crew, regardless of the weather on the surface. To make this possible, an air lock has been built into the forward underside of the "Defender's" hull, with a trapdoor for exit, and a ladder down which the diver can walk to the sea bottom. In operation, the diver enters the air lock, the door into the submarine is closed, and water is gradually admitted until the pressure within the lock equals the pressure of the sea outside. When the two are equal, the diver can open the outer door and lower his ladder, climb down and walk across to the damaged ship. When his work is finished, he re-enters the lock,

Diver Trying the Sea Door of the "Defender" and Preparing to Leave the Air Lock Which Admits to the Sea

closes the sea door, and the pressure is then gradually reduced, or, by raising it slightly by forcing in air, the water can be blown out and the air pressure then reduced until all danger of the "bends" is past. With the ability to work alongside a damaged craft, it is believed air or oxygen lines can be attached much more quickly than from the surface, to supply air to the crew, and, using the rescue boat's pumps and motors, water can be blown out of the damaged boat to help it rise to the surface.

MAGNET TEST ON BRIDGE WIRE REVEALS DEFECTS

Every inch of the wires that are being woven into the big cables for the Ambassador bridge, to connect Detroit, Mich., with cities in Ontario, is subjected to an interesting magnetic test to reveal any departures in the standard of requirements for the metal. The method is a simple one, and its principle is well known. The wire is passed along from the last operation in the mill to the reels on which it is wound for shipment, and as it moves, it acts as the core of a transformer, the primary winding of which is energized by alternating current. Any irregularity in the current generated in the secondary winding of this transformer, indicates some irregularity in the physical properties of the wire, and any fluctuation beyond the high and low limits established, is cause for rejection of a portion of the wire. The test does not show just what is wrong, but serves as a signal for a further inspection and is applied in addition to a number of other trials which the metal must pass before it is allowed to be used in the big cables that will support the span.

¶Whenever you wish to know more about any article in this magazine, write our Bureau of Information.

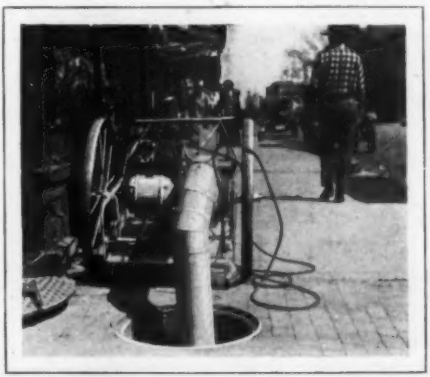
Work Track in Small Sections to Simplify the Removal of Rails or Laying a Curve

FLEXIBLE WORK-RAIL TRACK SIMPLIFIES CURVES

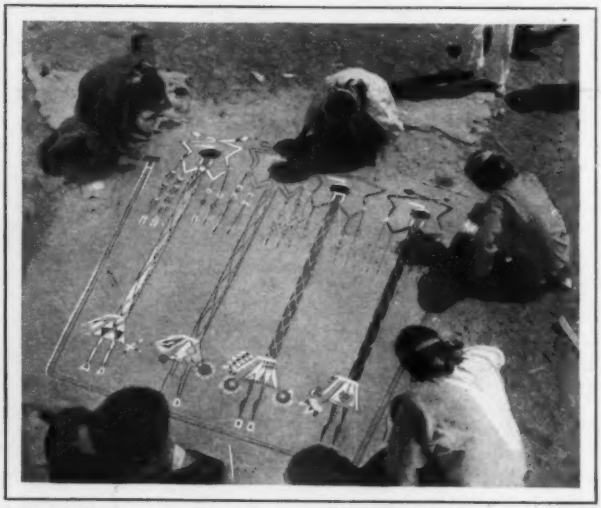
Construction of narrow-gauge track lines in work yards and other places is simplified with the use of a section in segments of small units, especially useful in laying a uniform curve. The rail sections rest in saddles mounted on steel crossties. This arrangement also lightens the task of moving the track to either side.

FAN VENTILATOR FOR MANHOLE HELPS PREVENT EXPLOSIONS

To insure adequate ventilation for the workers in manholes, and to drive out gases that might cause explosions, a Minnesota public-utility concern has developed a fan blower and pipe which is placed in the hole to provide fresh air. Used before men are allowed to enter the passage, it removes all dangerous vapors and then can be employed to furnish a supply of fresh air as long as the men are at work.



Ventilating Manhole with Pipe and Blower



Medicine Men of the Navajo Indians Executing a Mystic Sand Painting for Use in Their Religious Rites

INDIAN SAND PAINTING SHOWS DANCE OF FOUR SEASONS

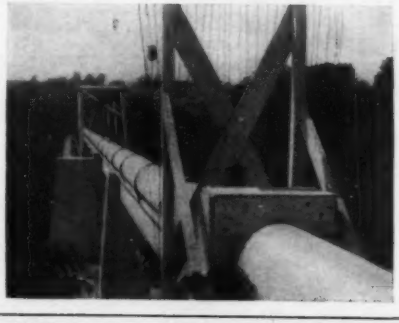
Navajo medicine men recently demonstrated their skill at one of their oldest and strangest ceremonies, the preparation of mystic paintings on sand. Colored rocks and mineral ores are crushed to a fine powder and used as the "paint" to form the designs, which are traced on a smooth bed of light-colored sand. The figures in the accompanying photograph represent the four seasons, each dancer holding the "snakes of creation."

SUGAR FROM CORNSTALKS SEEN AS FUTURE FOOD

Sugar may be extracted from cornstalks or the waste wood of lumber camps and sawmills, according to Dr. Friedrich Bergius, famous German chemist, who recently visited the United States. He has developed a process in Germany for extracting glucose from waste wood to provide cattle food. With further refinement of the product, it may be made useful as a food for humans. Agriculture, he says, has only developed, over a period of thousands of years, comparatively few species which yield carbohydrates in suitable form for human or cattle food. Other forms of plant life, notably rich in this concentrated form of sun energy, provide food only for lower forms of life, including insects and microbes. As at least forty per cent of the material is wasted in producing lumber, a vast amount of possible food is sacrificed. In this process, one hundred parts of wood, when treated with hydrochloric acid at a high temperature, yield seventy-five parts of glucose, and of the latter substance something like eighty parts are carbohydrates fit for human consumption.

CITY'S AERIAL SEWER LINE SUBSTITUTE FOR TUNNEL

Engineers at Sioux Falls, S. Dak., solved a problem in sewage disposal by building a concrete pipe line on a trestle instead of digging a tunnel under the river. The latter method would have been impossible because of the depth to which the bore would have had to be excavated. The cement tubing is of special construction, two feet in diameter at upper end and increasing to forty-two inches toward the lower section, to accommodate the inflow from the laterals. Concrete piers and a suspension framework along the section that crosses the river, provide the means of support.



Aerial Sewer, Built of Concrete, Suspended across a River, Found Better Than Tunnel beneath Stream

LATEST STUNTS THOUGHT UP BY CIRCUS CLOWNS

Some of Al Bruce's Most Effective Laugh Makers, Always Popular with Circus Crowds; the "Patent Cigar Lighter" Was Especially Effective

Thinking up new ideas for clown stunts is one of the important duties of producing experts who help give the circus its popularity, and one of the leaders in this profession is Al Bruce, with the Ringling Bros. and Barnum and Bailey combined shows. One of his most amusing devices this past season was the automatic cigar lighter, operated on the complicated principles of a cartoon and failing to light about as often as it was successful, thus arousing laughs from owners of pocket lighters who had experienced the same difficulty. Bruce also has arranged a vacuum cleaner to operate a set of Scotch bag pipes and play music, while the weather joke is manifest in a set showing a clown seated on a stove while smoke pours from the stove pipe and steam issues from a tea kettle on the clown's head. "Will Summer Ever Come?" is the natural question this arrangement inspires. A school "persuader" consists of a large hand that paddles a boy as he walks along, thus inducing him to attend his classes. Many of the clown acts receive rehearsal at the circus' winter quarters at Sarasota, Fla., where new ideas are developed for the coming season, while the performers and animals make ready for another tour.

To Save Work

Rotary Ironer Saves Time and Labor on Flat Work and Is Said to Leave a Sheen Superior to That Afforded by Hand Methods; Unit Occupies Little Space When Not in Use; Operator Remains Seated

For Any Kind of Oven, This Meter Shows Right Temperature for Baking Different Kinds of Food; It Responds Quickly, Is Accurate and Portable; It Also Serves as a Check for Automatic Heat Controls, to Show if They Are Functioning

This Hand Hot-Pan Lifter Also Opens Jars and Bottles When Turned Upside Down

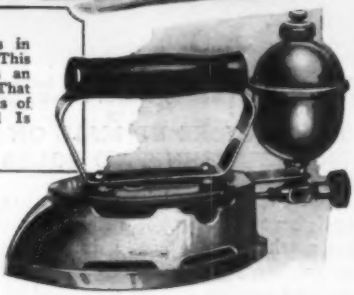
To Line the Garbage Bucket, Keeping It Clean, a Paper Bag Is Easily Lifted Out and May Be Discarded with the Rubbish

Fizz Top for Beverage Bottles Is Screwed through Cap and Operated by Simply Pressing a Button

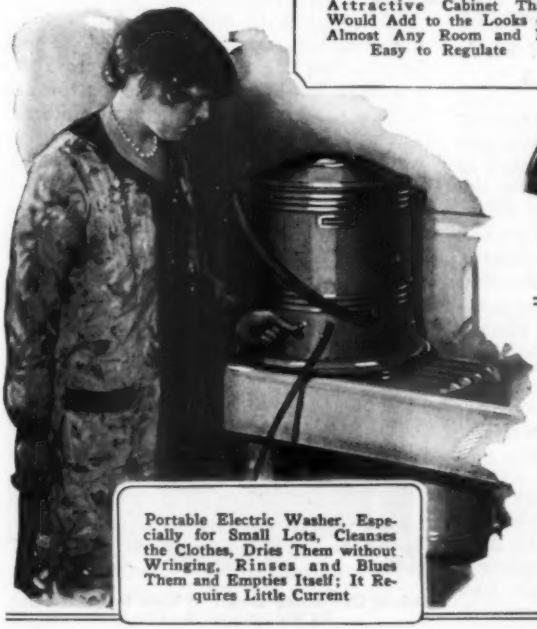
in Your Home

For Opening or Closing Bottles and Cans of Many Sizes; Simple Wrenchlike Tool Affords a Strong Grip, Is Easy to Operate and Requires No Adjustments; the Teeth Prevent Slipping and Notch on Side Takes Caps Off

Illustrating the Changes in Appearance of Stoves; This Heater Is Fashioned as an Attractive Cabinet That Would Add to the Looks of Almost Any Room and Is Easy to Regulate

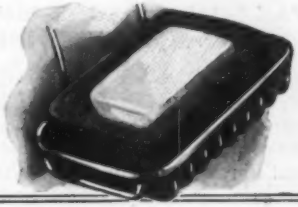


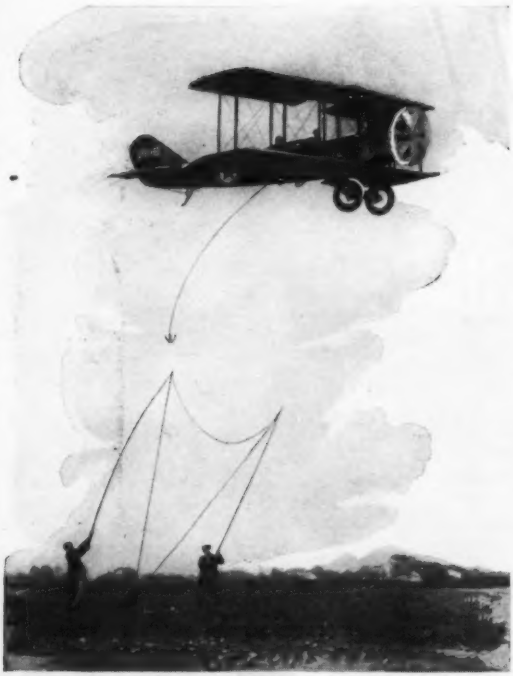
Iron with Gasoline Heater Attached Is Quickly Warmed as No Preheating or Generating Is Necessary



Portable Electric Washer, Especially for Small Lots, Cleanses the Clothes, Dries Them without Wringing, Rinses and Blues Them and Empties Itself; It Requires Little Current

To Keep the Soap Dish Clean and the Cake from Slipping Out; a Rubber Inset for the Holder





Plane About to Hook Bag from Cable between Poles Which Are Held by Men in Pick-Up Test

PLANE PICKS UP MAIL ON FLY BETWEEN TWO POLES

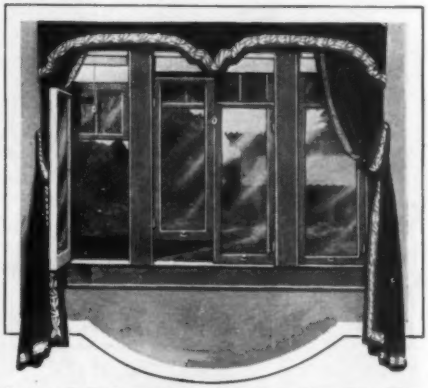
Snatching a mail bag with a grappling hook between two poles held by men, was the method successfully demonstrated at an eastern flying field to show how the air-mail service may be extended to places that have no airport facilities. The bag is dropped at its destination by parachute. During the tests, the hook did not once fail to catch the line to which the bag was attached, so that it could be hauled aboard the plane. The poles are of bamboo and are easily managed.

WAX COAT ON BOOK BINDINGS PROLONGS THEIR LIFE

By coating leather book bindings with wax, oils or grease of special kinds, the bureau of chemistry has helped to preserve some of the volumes in the congressional library. Impurities in the air, and the action of both natural and artificial light and of gas fumes, have been found injurious to leathers. The backs of books, infrequently used and standing on exposed shelves, often are reduced to a state of powdery decay while the covers are but little damaged. Chemical analysis of this decayed leather has shown that it has a high degree of acidity, a high sulphate content and water-soluble nitrogen compounds. Part of this deterioration is believed to be due to the harmful sulphurous and acid impurities taken up in destructive quantities from a polluted atmosphere. Other causes of the decay are improper methods used in tanning the leather and injurious finishes applied to it.

SLIDING SASH SWINGS IN TO AID CLEANING

Windows that slide up and down as do ordinary sash, but also swing inward on hinges so that the outside of the pane may be reached from the inside, have been introduced. They are designed to afford security against the weather, may be installed in old frames, and the transom sash across the top may be lowered to the bottom to form a protecting rail to guard children. The window can be held at various angles, when swung inward, by means of adjusters on the sill.



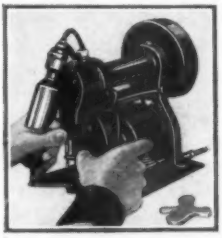
Sash at Left Swung Inward to Show How Pane May Be Washed from the Interior

OLD MOVIES FEATURE CIRCUSES TRAVELING IN FRANCE

Motion-picture films, long out of date, are shown in small and remote villages in France, at the "cine-circuses" as they are called, traveling shows that visit out-of-the-way places as the small street carnivals sometimes do in this country. The films are purchased for a small sum, and an outfit consisting, perhaps, of four wagons, hauled by a tractor and carrying its own electric generator, a small troupe of performing animals and a magician, will travel a wide circuit in a single season. A tent is pitched and a man is sent around with a drum to advertise the performance. An old phonograph is played with the reel. A recent show advertised a "new drama," which, however, proved to be taken about eighteen years ago.

PORTABLE CUTTING MACHINE MAKES MANY DESIGNS

An improved portable cutting machine to cut the intricate designs used by window decorators, model makers, and in similar work, has been developed. An older machine was swung from an extension arm and the work moved past under it, while the new one slides along the work so that it is possible to cut a design in a strip of wallboard or similar material of any length. It works something like a sewing machine. Instead of a needle, there is a small chisel, striking 2,000 blows a minute, which is mounted on a swivel so that, as the machine is moved, the chisel turns and follows the pattern line. The length of the chisel stroke is adjustable for various thicknesses of work. The new model also is provided with tiny saw blades for work that is too hard or thick to be cut by a chisel. The machine is turned upside down and attached under a small metal saw table. As the saw blade swivels freely in any direction, it is possible to cut an intricate design without turning the work.

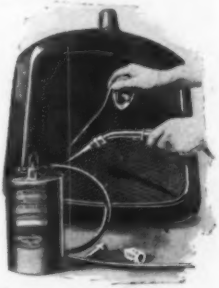


Inflating the Cushion, and Slipping It into Pocket; It Is a Valuable Aid to the Bleacher Fans

INFLATED PAD FOR HARD SEATS FITS IN POCKET

Hard seats at football or baseball games hold no terrors for the person equipped with a small pneumatic cushion now on the market. It can be blown up in a few seconds and, when deflated, fits in the coat or trousers pocket.

DRY-GAS SOLDERING TORCH NEEDS NO GENERATOR



Ready for quick service at all times, a gasoline torch now on the market burns dry gasoline gas, requiring no generating. It gives a clean, hot flame of different sizes suitable for soldering jobs of all kinds. The torch is operated on air-tank pressures of five to 200 pounds.

Easy Escape Tricks

With Hands Bound and a Rope Threaded between Them, It Is Still an Easy Matter to Escape by Pulling the Rope Down between the Wrists and Pushing It Over the Left Hand

By SAM BROWN

HI, HO, ho, and a rope. Let's go!

The performer's wrists are securely bound together with a large handkerchief, and a length of rope is looped over it, as shown. A spectator holds the ends of the rope. Looks as if the performer was hitched for life, doesn't it? But no; he turns his back for a moment, and—presto! —there stands our hero, wrists still bound, but entirely free from the rope.

And how does he do it? Simple! Tie yourself as illustrated, and loop the rope between your wrists. To free yourself is but a matter of pulling the rope down between your wrists and over either your right or left hand, as shown.

In the next one, the performer is bound to a chair, the rope running under the chair seat from one wrist to the other. A screen is placed around the performer. Well, you know what happens.

The secret of this tie depends on the fact that knots made with a free end around a tightly stretched rope can be nothing but slipknots. That's what happens when the performer's right wrist is tied, after the rope has been stretched under the chair seat from his left hand. To free himself, he bends over, as pictured, and with his left hand pulls the slipknot on his right wrist until he can free his hand. Simple, isn't it?

If you want comedy, try this one. But —and this is important—pick a good-natured man to work with.

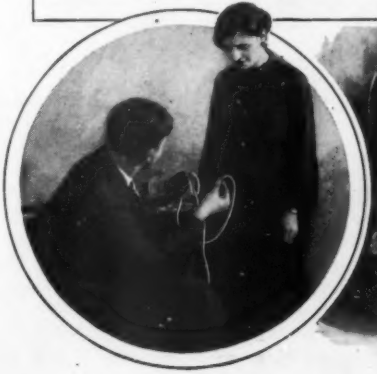
The idea is to take off a man's vest without removing his coat. Like this: Unloosen the buttons on the vest, also the adjusting strap in back. Then reach down inside your victim's coat, and pull the vest

well up over his head as illustrated. Slip both shoulders out of the vest. Now, taking the vest in your left hand and inserting your right hand up the victim's sleeve, you pull the left sleeve of the vest (whatever that is) down until it can be slipped over his hand, as shown. That's the hardest part of the trick and it will take some experimenting until you can do it without an undue amount of "wear and tear." After that, it is a simple matter to push the vest around the victim's back, and remove it from his right coat sleeve. But pick your man.

Three Stages in the Chair Tie and Escape; and, Top, the End of the Handkerchief Tie, When the Rope Is Shed

This one is with a sack. The performer is placed in the sack, and the drawstring is tightly pulled and tied. A screen is placed around the performer. A moment later he appears, with the still tightly tied sack hanging over his arm.

The hardest part about this trick is getting the sack. Usually you have to make your own. Make it plenty big, and sew a one-inch hem around the top, through



which you thread the drawstring. A small portion of the seam is left unsewn, so that you can easily get at the drawstring from the inside of the sack. And that's the whole secret. While you are standing, waist-deep, in the sack, you hook one finger onto the string through this small opening, and pull about a yard of it down into the bag. To release yourself, then, is simply a matter of letting go of the slack. The original knots are then untied and retied, while the added length of drawstring is cut from the end of the rope and stuffed into your pocket.

Another comedy effect: The performer's hands are tied behind his back. He then requests one of the spectators to tie his ankles together, and while this is being done, he calmly releases his hands, and, pointing to the knots around his ankles, gurgles, triumphantly, "Now, Helen, tie 'em tight!"

This tie is easy. The first stage is shown in the pictures. Notice that there is but a single knot on the right wrist, and that the hands hang straight down, and are uncrossed. When the spectator goes to make the final knots, the performer raises his hands high behind his back and crosses them, as illustrated. And what have you? Nothing more nor less than a two-inch piece of slack, twisted up between your wrists. By returning your hands to the position shown, the left hand can be easily removed.

Ever Take a Man's Vest Off without Removing His Coat? The First Requisite Is to Pick a Good-Natured Man, For the Feat Is a Major Operation

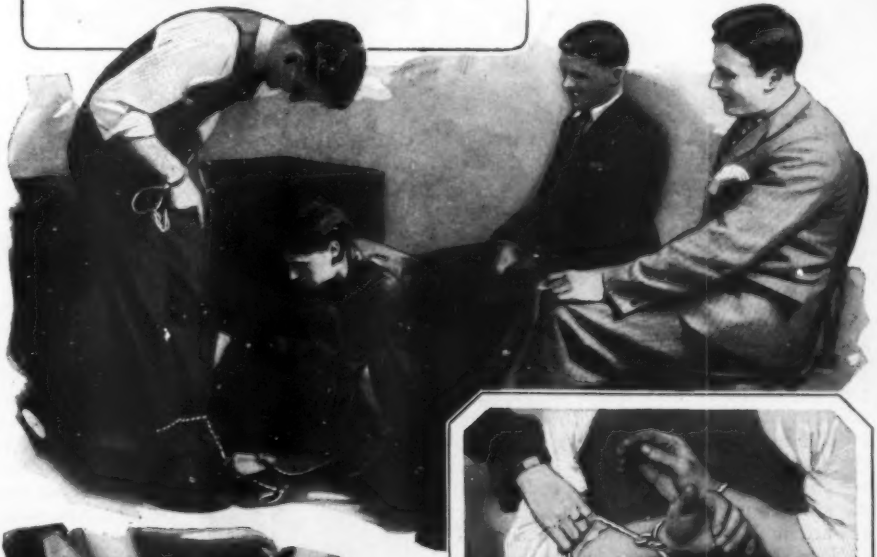
For the next one, the performer's wrists are securely bound with a piece of light cord, with about twelve inches of slack between them. A spectator hands the performer a ring. The performer turns his back. When he turns around again, the ring is found securely tied onto the string, and it cannot be removed without untying the performer's wrists.

Oh, it's all very simple. When the performer turns his back, he threads the ring on the string as shown. He then pulls the loop up over his wrist as illustrated, and there you are—the ring is on the string, and the fair spectator just can't imagine how it ever got there.

For those who want something more complicated than rope escapes, handcuffs

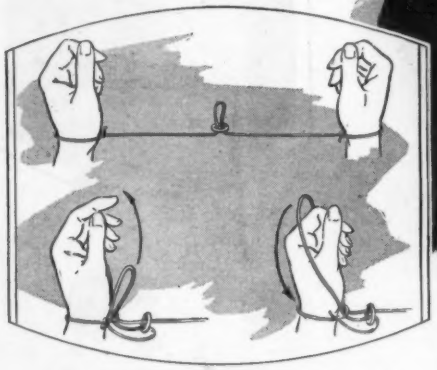
The Performer Is Tied in the Sack, at the Right, and a Few Seconds Later Steps Out with the Sack over His Arm, at Left

The Comedy Tie, Below, Is Always Good for a Laugh; After a Spectator Has Tied the Hands and Starts Tying the Feet, She (or He) Finds the Performer Using His Freed Hands to Point With



The Secret of the Comedy Tie, at Left, and, Right, How the Hands Are Held to Conceal the Looseness of the Knot

have always exerted a lure. Dealers in magicians' supplies sell various kinds of handcuffs, some with trick locks, concealed release buttons or other gadgets, and others which are simply standard cuffs made for police use, but which can be picked with ease, if you know how. One of the trick cuffs widely used by stage magicians has a clever lock which operates in certain sequences, locking perfectly for a certain number of times, and then releasing automatically. The usual arrangement is to exhibit the handcuff, unlock it, lock it again, pass it to the audience, which finds the lock secure, then unlock and place it on the wrists. The last operation brings the hidden release into action and the cuff can be removed instantly by pressing a button.



Slipping a Ring onto a Cord, Tied between the Hands, and Knotting It There So Securely It Can Only Be Removed, Apparently, by First Untying the Cord

Stage performers who use strange handcuffs have to be lock experts, and also well equipped both with keys and lock picks. There is one make of handcuff used by many police departments which is easily picked with a piece of watch spring. The cuff belongs to the type in which one bar, with a series of teeth, passes through the other, so that an effort toward moving it only causes the handcuff to become tighter on the wrists. However, with a small piece of watch spring filed down very thin, it is possible to escape by simply slipping the pick between the lock and the bar, lifting the latch and holding it up while the bar is slid out. With such a pick, which can be concealed between the fingers or about the clothing, the handcuffs can be removed, with the hands behind the back, in less than thirty seconds.

WICK CLEANER FOR OIL STOVES GIVES BETTER FLAME

Oil stoves cook more efficiently when the wicks are in good condition, and to keep them so, a cleaner has been devised that scrapes off the charred part through three slots, the flanges of which serve as blades. With this cleaner, the wicks can be trimmed so that they will have either a sloping or a chisel edge to give the most effective flame.

¶Oil of the Japanese peppermint is one of the sources of menthol.

ELECTRIC CHIMES RUNG THRICE A SECOND

By means of an improved electric installation for ringing chimes, blows may be repeated on the same bell at the rate of three times per second, the manufacturers declare. This has been made possible by a system of magnets. The playing is done on a keyboard, which can be installed at any convenient place, and the control wiring is usually connected to the lighting circuit. It operates at low voltage. An installation at Dartmouth college has, in addition to the keyboard, a machine like a player piano which automatically rings long changes of the bells when released by the tower clock.

RAZOR BLADES SERVE AS KNIFE IN HOLDER FOR ALL SIZES

What to do with your old safety-razor blades is no longer a perplexing problem since the introduction of a holder that makes an efficient knife and scraper out of them and that takes blades of any make. It is essentially like a pocketknife, is flat for convenient carrying in the vest pocket, the blades are easily inserted or taken out, and the holder locks when closed or open, thus preventing the blade from slipping or tearing the pocket. The case is shaped to form a good gripping handle. The cutter has wide application for clipping newspapers, cutting threads and seams, for scraping paint off windows and for practically all purposes where a strong, sharp knife is needed.

Opening Razor-Blade Holder, and Blade Samples

Ripping Brush from the Deserts with Tractor Armed with Knives That Cut Growth Close to Roots

TRACTOR ARMED WITH CUTTER HELPS RECLAIM DESERT

Sagebrush and greasewood are cut and torn from the soil by a tractor used in reclamation work in the southwest and other sections. It is fitted with a deep-set knife blade that separates the growth at the roots. The tractor illustrated here is being used to clear 18,000 acres in a desert.

LIGHTED PLANES AS BIRD LURE LATEST AVIATION PERIL

Flying lighted airplanes at night has met with a hazard from an unexpected quarter. Not long ago, several army planes, flying in formation over Washington and with searchlights turned on, encountered flocks of birds, lured by the lights. One of the birds collided with a wheel, and the aviators spent a few anxious moments as their planes passed through several flocks. Had one struck against a propeller, serious consequences might have followed.

Three-Octave Piano, Which Never Needs Tuning, Aids in Music Lessons When Instruments Are Impractical

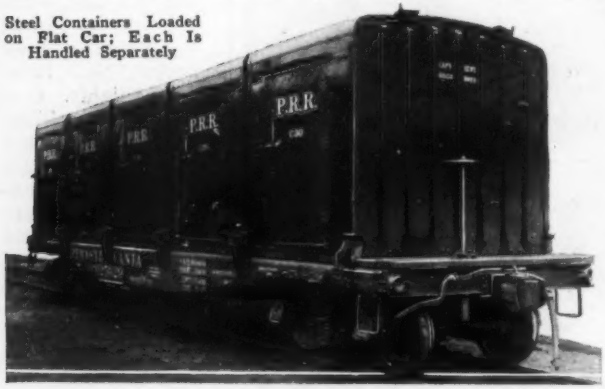
TINY PIANO WITH FEW OCTAVES AIDS MUSIC BEGINNERS

To help teach small children, a tiny piano with but three and one-half octaves, has been introduced. It is considered an improvement over charts and other devices of the kind, as it has the true piano action, aiding in the development of touch, and produces tones like those of a full-sized instrument. The small piano never needs tuning.

STEEL-CONTAINER FREIGHT CAR SERVES SMALL SHIPPER

For less than carload lots, portable steel containers of a carrying capacity of five tons each, which can be moved directly from the freight car to an automobile truck, have been introduced. They simplify the task of delivering goods to the consumer from the terminal, eliminate extra handling and have also made lower rates possible, as the railroad company does not have the responsibility of loading and unloading the goods. For patrons who desire the service, a car-loading and distributing company collects articles, places them in the containers and then loads the big steel holders on the railroad flat cars.

Steel Containers Loaded on Flat Car; Each Is Handled Separately



SHEEP DIP KEEPS DEER AWAY TO PROTECT ORCHARDS

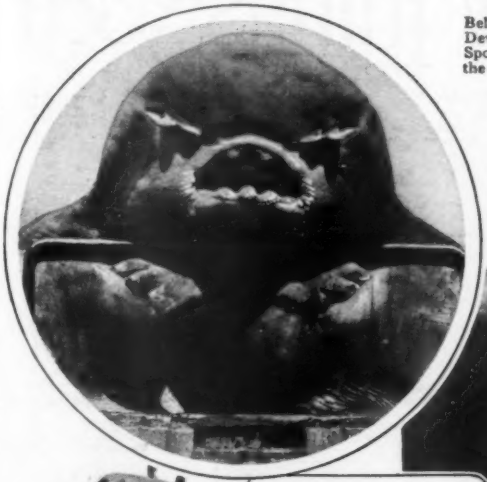
To keep deer from eating the foliage of fruit trees in certain parts of the west where the animals are protected by the game laws, growers are hanging a small piece of woolen cloth saturated with sheep dip on each tree. The odor is unpleasant to the deer and keeps them away. One soaking is sufficient for about six weeks. The method is said to be as effective as spraying and is less expensive.

RADIO "ECHOES" LOCATE SHIPS AT NIGHT OR IN FOGS

Methods of locating a ship's position by means of automatic radio signals have reached a high degree of dependability, according to Col. E. Lester Jones, director of the United States coast and geodetic survey. A sound is produced which travels from the ship through the water to two or more stations which automatically send wireless signals back to the vessel as soon as the sound arrives. This gives a measure of the distance of the ship from each station. Knowing the location of the two stations from previous surveying, the three sides of a triangle are known from which the ship's position can easily be computed. The method is essentially like that employed in making depth soundings by sending a sound wave to the bottom of the ocean and observing the time required for the echo to be reflected back and registered on the vessel.

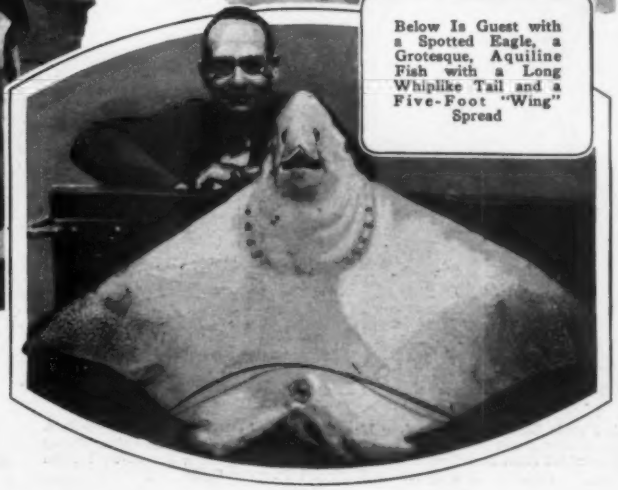
STRANGE FACES TO BE FOUND ONLY IN DEEP SEAS

Below Is the Head and Peculiar Armored Back of a Devilfish, Caught by L. Haden Guest, a London Sportsman, While Collecting Deep-Sea Specimens in the Teeming Waters off the South Sea Island Continent



Meet the Devilfish Face to Face, as It Appeared When Loaded on a Hand Truck Ashore; the Two-Ton Monster Bears a Close Resemblance to Old Statues of the God Moloch; It Came from Waters Full of Queer and Ugly Creatures

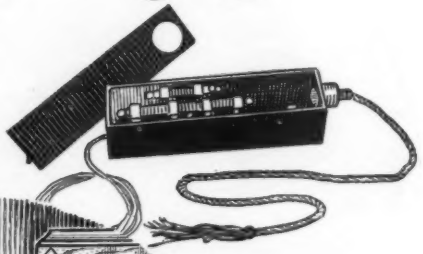
Below Is Guest with a Spotted Eagle, a Grotesque, Aquiline Fish with a Long Whiplike Tail and a Five-Foot "Wing" Spread

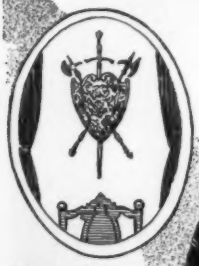


Above Is a Tiger Shark, One of the Larger Species of Deep-Sea Man-Eaters, Which Sometimes Attains a Length of Twenty-Five Feet in the Waters of the Coral Barrier Reef

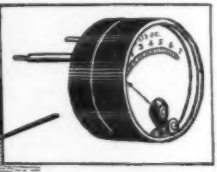
New Things Seen

Left, New A. C. Power Pack Makes Possible A. C. Operation of D. C. Sets without Changing the Set Wiring or Tubes; No Harness or Adapters Are Required; Right, a Power Supply and Converter for A. C. Tubes of the Arcturus Type

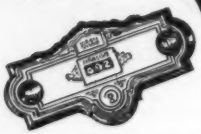




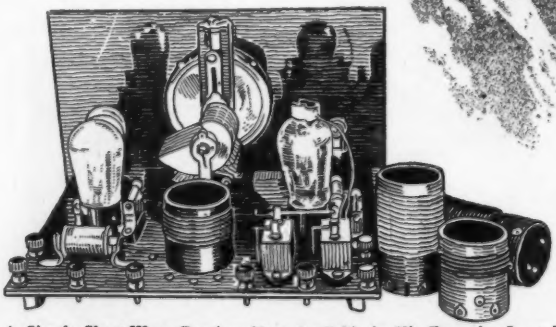
Above, Attractive Thirteenth-Century Shield, Fitted with Bronze Sword and Battleaxes, Conceals an Efficient Cone-Type Speaker Making a Useful as Well as Novel Decoration



Above, Pin-Jack Voltmeter, Designed for Standard A-Eliminator Units, When Equipped with Suitable Jacks Makes Possible Voltage Regulation for Maximum Tube Life; Below, Art-Moderne Radio Installation to Harmonize with the New Popular Style of Furniture



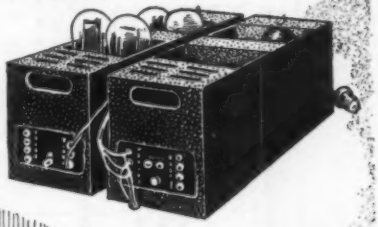
New Tuning Control Is Designed to Automatically Tune In the Station When the Correct Wavelength Number Is Turned Up in the Slot



A Simple Short-Wave Receiver Now Available in Kit Form for Long-Distance Broadcast Reception and Experimental Television Signals; Easily Assembled from Standard Parts, This Receiver Employs a Screen-Grid Tube and Specially Designed Plug-In Coils

Along Radio Row

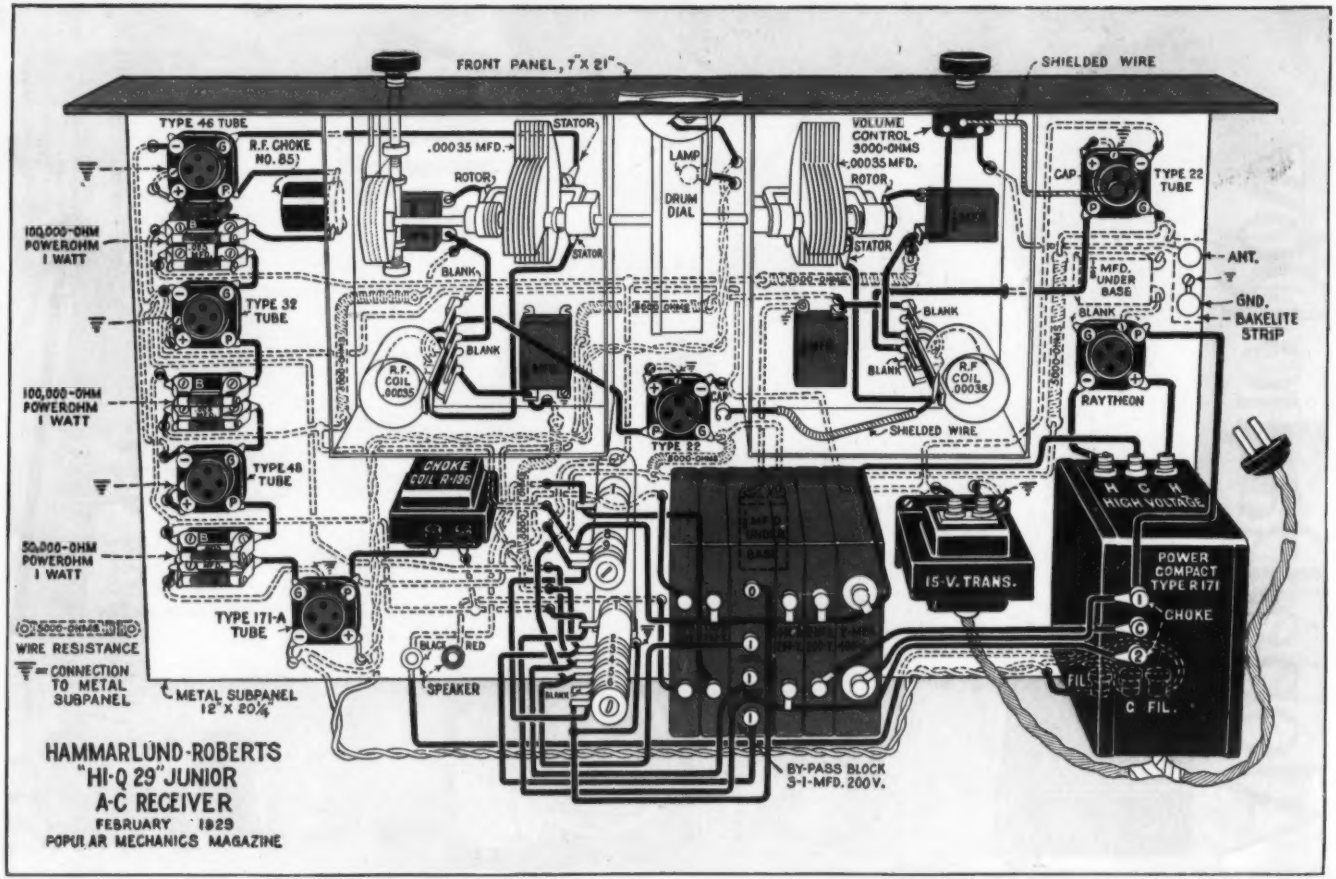
Left, an A and B-Eliminator Which Supplies All Required Voltages from D. C. Supply Lines, Ranging from 110 to 250 Volts, and Is Suitable for Sets Employing from 1 to 14 Tubes; Right, a Powerful Three-Stage Push-Pull Audio Amplifier, for Radio Set, Phonograph Reproducer or Microphone, Employs the New 250-Type Power Tubes



Above, an Unusual Speaker Designed for Bedroom, Library or Dining Room, Where a Small, Compact and Easily Portable Unit Is Desired; Speaker Is 5½ In. High and Comes in Several Attractive Designs

Right, Handy Adapter for Connecting Phonograph Pick-Up Is Available for Either Four or Five-Prong Tubes; Below, Resistance Unit for 32-Volt Systems Supplies Filament Current

Left, Device Which Protects A. C. Tubes from Varying Line Voltage; Right, an Ingenious Assembly for Television Reception Permits Accurate Adjustment of the Neon Tube and Automatic Speed Control



HAMMARLUND-ROBERTS
"HI-Q 29" JUNIOR
A-C RECEIVER
FEBRUARY 1929
POPULAR MECHANICS MAGAZINE

DESIGNED especially for those who wish a complete a.c. receiver of the latest type at a moderate price, the new Hammarlund-Roberts Hi-Q-29 Junior a.c. model described and illustrated in this article will please the most exacting set builder. It is a true single-control six-tube set employing a screen-grid antenna-coupling tube, a screen-grid tuned r.f. stage, a detector and three stages of high-quality audio amplification. The A, B and C-power apparatus is mounted directly on the steel chassis, making the receiver an entirely self-contained unit ready to plug into the light socket. The a.c. tubes used are of the Arcturus type.

The screen-grid coupling tube is used to isolate the antenna from the first tuned circuit, making possible efficient simultaneous control of both the detector and tuned r.f. stages, without necessitating any separate means of compensating for different types of antennas. The coils used in the r.f. amplifier employ primaries especially designed for screen-grid use, being small in diameter and consisting of a large number of turns of very fine wire. This design tends to equalize the amplification over the broadcast range.

The shielding of the screen-grid tubes has been handled in an unusual manner, the tubes being placed between the stage shields in such position that the control-grid and plate leads are very short. In ordinary practice, the tubes are placed within the stage shields and seldom properly shielded from the coils and tuning condensers.

Control of volume is accomplished by the use of a 3,000-ohm specially tapered potentiometer, connected between antenna and ground. The slider of this instrument is connected to the grid of the antenna-coupling tube, thus permitting any desired part of the signal voltage to be impressed on the grid, and resulting in a smooth, continuous control of volume.

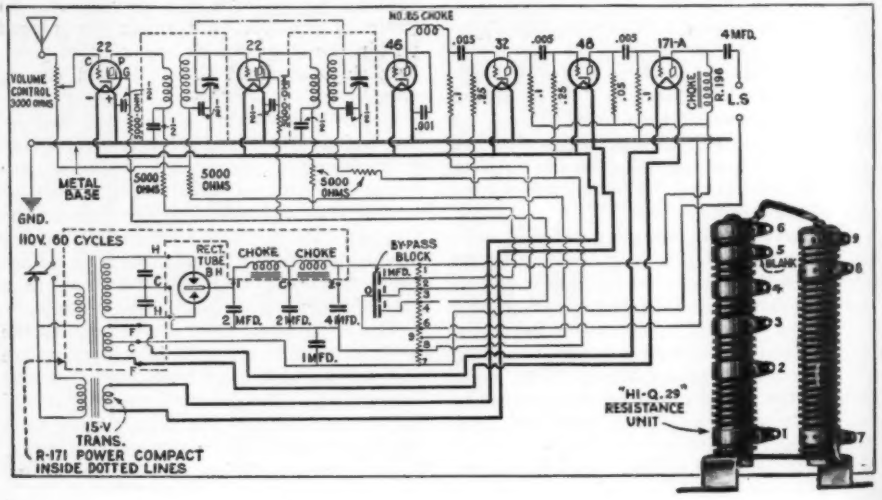
The circuit employed is not new, as the basic principles involved in its design are well-known and have been proved sound in practice. The claim to superiority lies in the fact that all the details have been carefully worked out with a view to securing the utmost efficiency, at the same time

taking full advantage of the desirable characteristics of the screen-grid tubes.

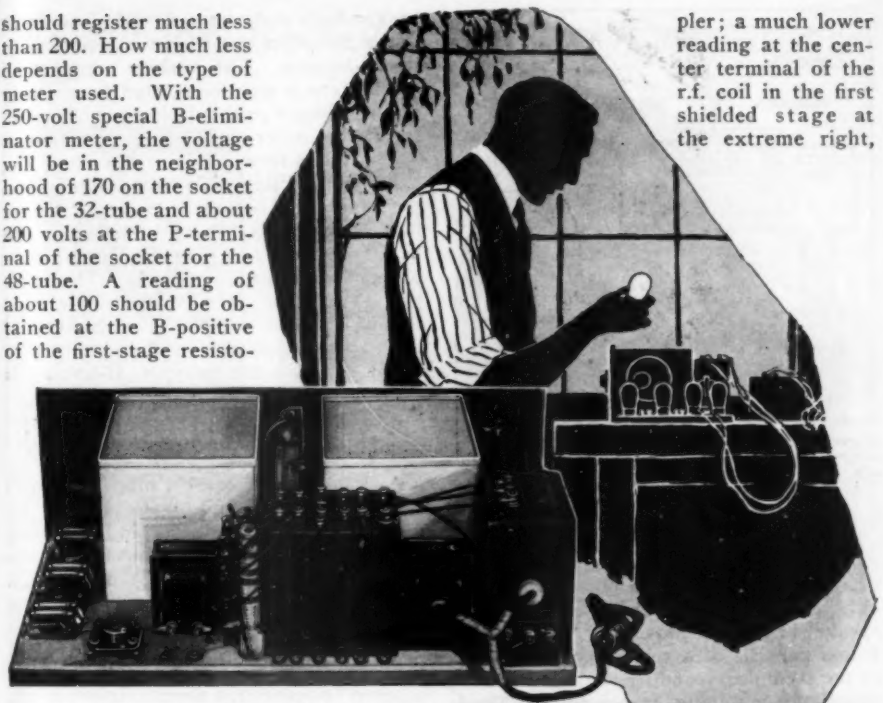
The parts are all standard and readily available in kit form, and the assembly is simple, as shown in the various illustrations. The schematic diagram is given for those who prefer it to the simplified form, and special attention has been given to clarifying the connections to the special Hi-Q-29 resistor unit in both diagrams; note that the posts have been numbered from the base up for convenience.

After the wiring has been completed, check the assembly and wiring carefully.

To test the power supply, a good voltmeter of the 1,000-ohm-per-volt B-eliminator type, reading up to 200 or 250 volts, must be employed. It should be of the double-reading type, unless a low-reading meter is also available, such as an 0 to 7 or 0 to 10-volt type. Place the Raytheon rectifier tube in its socket, leaving the other tubes out for the time being. The power end of the set may be checked as follows: Place the six resistors in the audio stages in their clips as shown in the diagram. Connect the negative terminal of the 250-volt meter to the chassis at any convenient point and turn on the 110-volt 60-cycle a.c. supply. Upon touching the P-terminal of the 171-A tube socket, a reading of over 200 volts should be obtained. The same reading should also be obtained upon touching the B-positive terminals of the second and third resisto-couplers. The P-terminals of the sockets for the 32 and 48-type tubes may now be touched, and the voltmeter



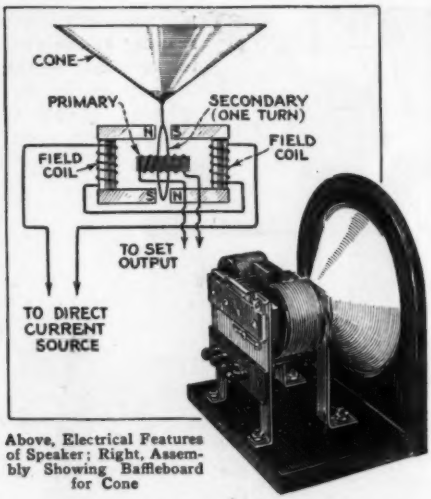
should register much less than 200. How much less depends on the type of meter used. With the 250-volt special B-eliminator meter, the voltage will be in the neighborhood of 170 on the socket for the 32-tube and about 200 volts at the P-terminal of the socket for the 48-tube. A reading of about 100 should be obtained at the B-positive of the first-stage resisto-coupler. The P-terminal of the socket, for the 46-tube, should show about 70 volts. The P-terminals of the screen-grid-tube sockets should show about 135 volts, and the G-terminals of the same sockets should show about 45 volts. These readings must be taken with a high-resistance voltmeter especially designed for use with B-eliminators.



If these tests are satisfactory, it is a good indication that the B-circuit wiring of the receiver and B-power supply are correct. If no voltage, or insufficient voltage, is indicated at any point, test back along the faulty circuit until the trouble is located. Check the C-voltages by connecting the positive terminal of the low-reading voltmeter to the chassis. When the negative terminal of the meter is touched to the F-terminal of the resisto-coupler in the second a.f. stage, you should obtain a reading of about 4½ volts. A much lower reading should be obtained at the center terminal of the r.f. coil in the shielded stage at the right. A reading of about 1 volt should be obtained at the F-terminal of the first-stage resisto-coupler; a much lower reading at the center terminal of the r.f. coil in the first shielded stage at the extreme right, and the same reading at the left-hand terminal of the volume control. The above instructions apply when the operator faces the set from the rear.

Now place all the tubes in their sockets, and connect the aerial and ground. The aerial should be about 75 ft. long, including the lead-in wire, for average conditions.

A large blueprint of the special simplified wiring diagram may be obtained from Popular Mechanics Magazine radio department, 200 East Ontario St., Chicago, for 15 cents to cover cost and packing. A copy of the material list will be mailed free to any address upon request.

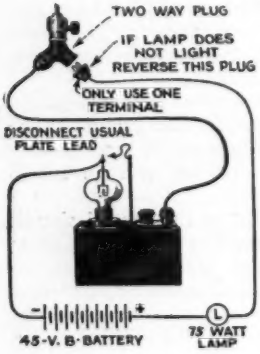


Above, Electrical Features of Speaker; Right, Assembly Showing Baffleboard for Cone

A Simplified Dynamic Speaker

A dynamic speaker of unusually simple design has recently been put on the market. It differs from the usual dynamic speaker in that the moving or "voice coil," which consists of a single turn, acts also as the secondary winding of the output or impedance-matching transformer. Thus the entire circuit between the transformer and speaker is one turn, consisting of a metal ring supported by flexible springs and fastened to the cone apex. The combining of the moving coil and the secondary into one unit is said to provide great mechanical simplicity and, at the same time, improved electrical efficiency.

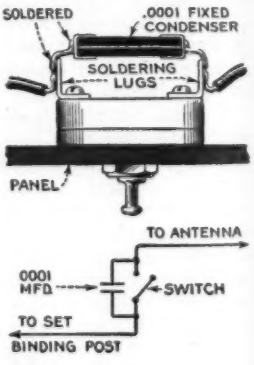
Charging Wet B-Batteries


TWO WAY PLUG
IF LAMP DOES NOT LIGHT REVERSE THIS PLUG
ONLY USE ONE TERMINAL
DISCONNECT USUAL PLATE LEAD
45-V. B-BATTERY
75 WATT LAMP

Wet B-batteries may be safely charged with the old-type standard 2-amp. tungar charger, if connected as shown in the sketch. Disconnect the plate lead from the terminal at the top of the tungar bulb and run a flexible lead from this terminal to the negative terminal on the B-battery. The positive terminal of the battery is then connected to one side of an ordinary procelain lamp socket, and from the other side of this socket a lead is taken to one side of a socket plug, as shown. Place a 75-watt lamp in the socket, and the battery is ready for charging. Use a two-way socket plug at the lighting fixture, and plug the 110-volt supply to the charger in one side. The other plug connection, carrying the single wire, is then plugged into the other outlet. If the 75-watt lamp does not light, reverse this plug. If more than one B-battery is to be charged, connect them in parallel.

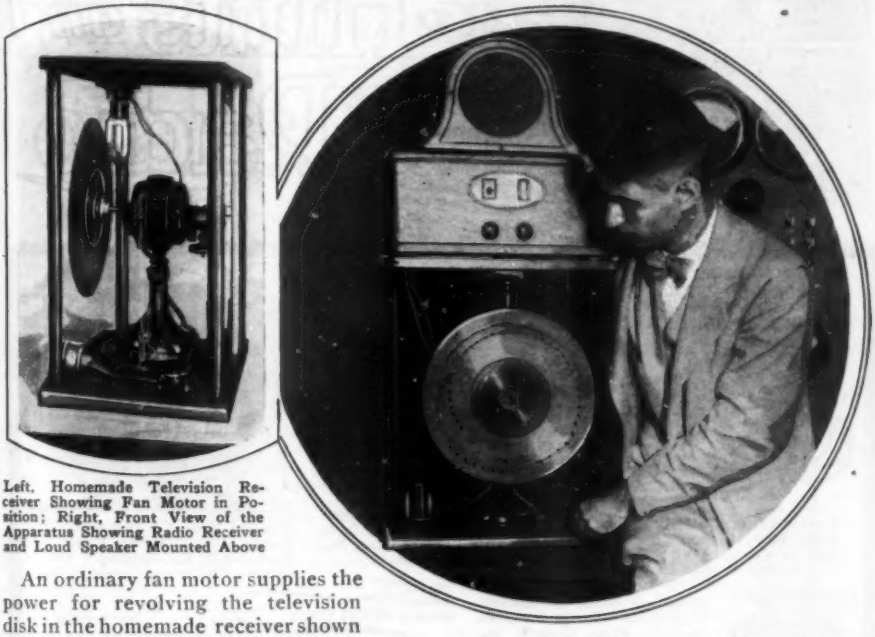
Switch for Short and Long Antenna

A simple means of obtaining the equivalent of a short and long antenna by means of a fixed condenser and switching device is shown in the sketch. In order to increase the selectivity of a standard set, a short antenna is usually recommended. As it is not always convenient or possible, however, to have two antennas, a fixed condenser is placed in series with the long antenna to secure the short antenna effect. Since it is desirable to have the advantage of a long antenna at times, the condenser may be shunted out by means of the filament switch. The same idea can be applied wherever a fixed condenser is temporarily required for testing purposes or for shunting across transformer or speaker windings to improve tone and pitch.—H. G. Schultz, Astoria, L. I.



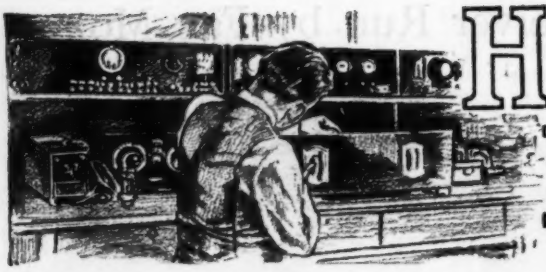
Popular Mechanics' radio department offers its information service free to all readers of our magazine. We will be glad to help you with your problems, and will promptly answer all inquiries.

Television Receiver Run by Fan Motor



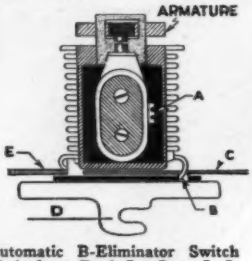
Left, Homemade Television Receiver Showing Fan Motor in Position; Right, Front View of the Apparatus Showing Radio Receiver and Loud Speaker Mounted Above

An ordinary fan motor supplies the power for revolving the television disk in the homemade receiver shown in the photos. The fan motor is already equipped with a suitable stand high enough for disks of the 24-aperture type; if larger disks are to be used, the stand will, of course, have to be placed on a shelf to obtain the necessary height for centering the disk. Two boards, cut from 7/8-in. material, are used for the top and bottom of the supporting frame. The length of the uprights, which may be made of wood or gas pipe, depends on the size of the disk. If of wood, each should be braced by means of angle irons at top and bottom. Gas pipe, cut down to proper lengths and threaded by the local plumber, can be obtained at small cost and, when screwed into deck sockets which are in turn screwed to the top and bottom boards, will make a sturdy framework that will support the ordinary broadcast receiver. Paint the framework a dull black and mount the motor and neon tube as shown, an ordinary X-type tube socket for the neon tube being screwed to the underside of the top board behind the upper edge of the disk. Mount the socket so that the plate of the tube is directly behind the perforations in the disk. A variable resistance with a suitable push-button shunting device, such as the Clarostat television-motor control unit, is connected in series with one side of the 110-volt supply line to the motor. The television disk may be homemade, but as this is difficult, the builder had better purchase one of the standard disks now available. The radio receiver for picking up and amplifying the television signals may be any of the standard short-wave or broadcast types employing two stages of a.f. amplification, but the resistance-coupled type is preferred for television reception. A d.t.d.p. switch is used to throw the output of the receiving set from the loud speaker to the neon tube for picture reception. If the receiver is of the standard broadcast type and the television signals are transmitted on short waves, a short-wave adapter may be employed. A suitable adapter was described in the March, 1928, issue. This number, as well as a blueprint of the layout and wiring diagram are available from Popular Mechanics radio department, at 25 cents each.

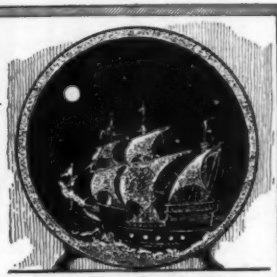


Hints and Radio

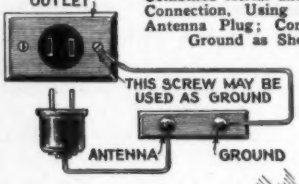
Circuit Tester; Insulate Spring Post; Lamp Lights When Circuit Is Completed; Posts Shorted Restore Lamp



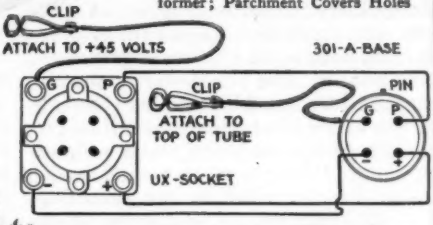
Automatic B-Eliminator Switch Made from Ford Cut-Out; It Is Mounted on a Bakelite Base; See Page 309 for Details



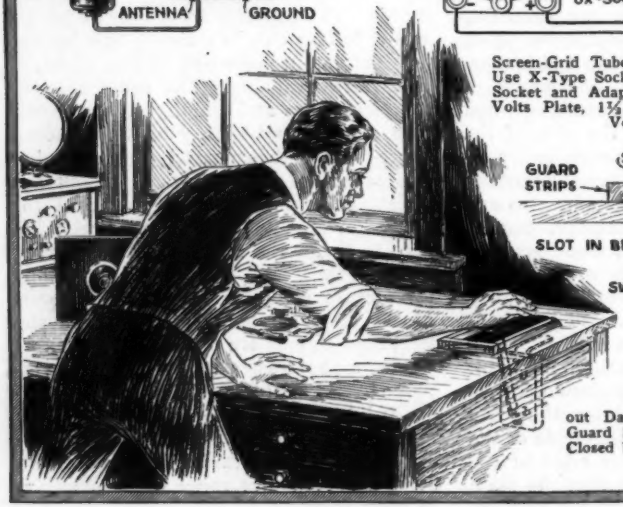
Ship and Moon Cut-Out on Loud Speaker Illuminated by Bulbs at Back, Lit by Bell-Ringing Transformer; Parchment Covers Holes

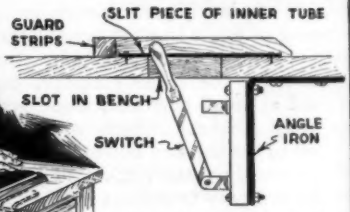


Combined Aerial and Ground Connection, Using Standard Antenna Plug; Connect the Ground as Shown



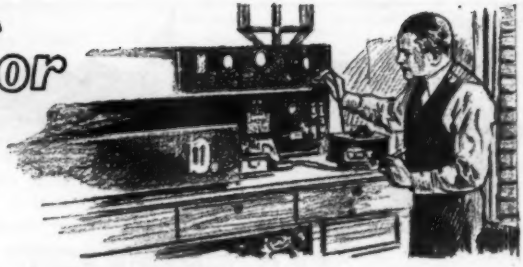
Screen-Grid Tube Adapter for Tube Tester; Use X-Type Socket and Base; Plug Tube in Socket and Adapter in Set; Use 90 to 135 Volts Plate, 1½ Volts Negative-C and 3.3 Volts Filament

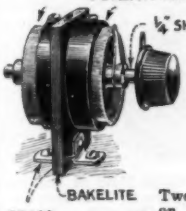


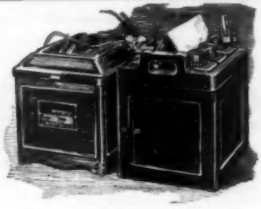


High-Voltage Switch, Mounted as Shown, Is Worked Conveniently without Danger of Accidental Shocks; Guard Strips Prevent Switch Being Closed by Objects on Bench Pushed against It

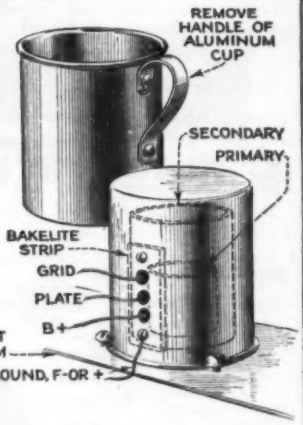
Kinks for Fans

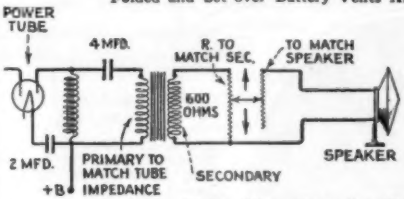






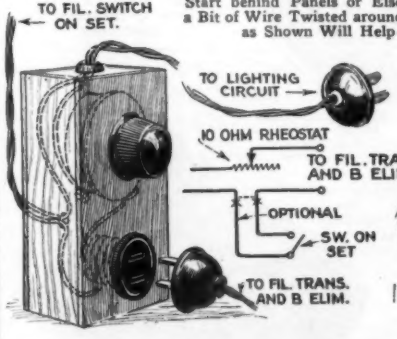
Two Potentiometers, Mounted Back to Back on Same Shaft, as Above, Make a Volume Control for the Speaker without Changing Resistance or Impedance; Circuit Is Given Below; Shaft Forms Connection between Potentiometers; Right, Blotter Folded and Set over Battery Vents Absorbs Spray





Aluminum Cups Form Handy R. F. Coil Shields, Neat and Easy to Make

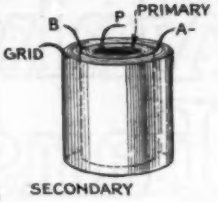
Right, When Nuts Are Hard to Start behind Panels or Elsewhere, a Bit of Wire Twisted around Them as Shown Will Help



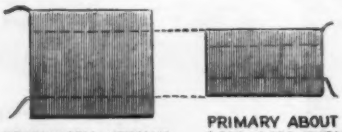
Voltage Control Protects A. C. Tubes; Set Rheostat for Trial with Set On; Turn Set Off Till Tubes Cool; Turn On; Tubes Should Take 30 Seconds to Heat; If Not, Readjust Rheostat Right or Left

Rebuilding Burned-Out Transformers

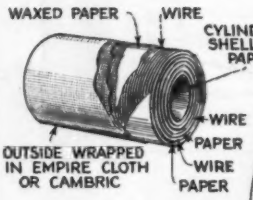
Disassemble the Burned-Out A. F. Transformer as Shown Above; the Parts Are Laminations, Secondary, Primary and Shield



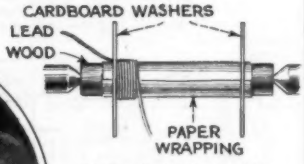
Above, Primary and Secondary Assembled; P and B Are the Primary Leads, a Negative and Grid the Secondary



Above, to Separate the Coils, Hold in Boiling Water Until the Paraffin Softens, Then Remove the Primary by Pushing It Out with a Round Stick as Shown in the Photo Below



The Coil Construction Is Clearly Shown in Sketch Above; Rebuilding a Primary Coil Is a Simple Matter; a Burned-Out Secondary, However, Is beyond the Average Experimenter, Owing to the Large Number of Turns of Fine Wire

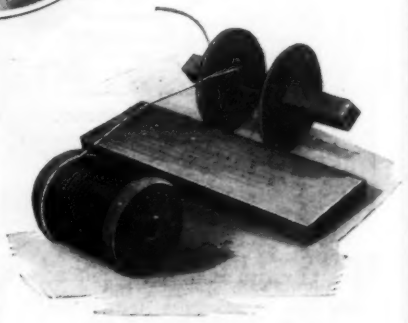


Above, Coil Mounted for Winding; Count Turns on First Layer and Multiply Layers for Total Count; Cover Each Layer with Paraffin Paper; Dry Coils in Slow Oven before Reassembling

Measure the Inside Diameter of the Old Primary Coil and Cut a Stick of Wood the Same Thickness; Wind Several Layers of Well-Shellacked Paper the Width of the Coil, and Mount Cardboard Disks to Form Retainers; Thread the Starting End of the Winding through One Disk, as Shown at Right

ENAMELED-WIRE TABLE

GAUGE	TURNS PER LINEAR INCH	RESISTANCE PER 1,000 FT.
40	130	1,069. OHMS
42	168	1,667 "
44	210	2,655. "
30	64	105.25 "

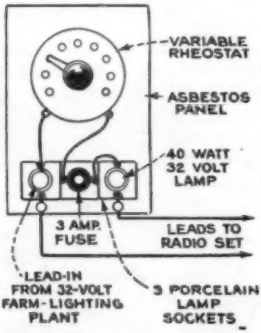


Automatic Switch from Ford Cut-Out

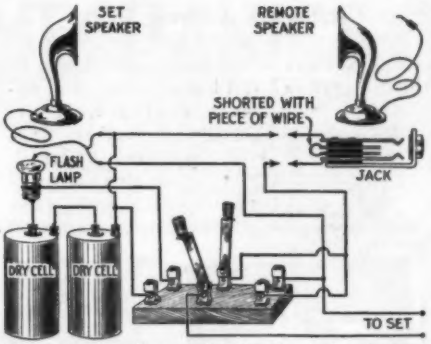
The automatic switch for B-eliminators, shown on page 306, needs a little explanation. Disconnect the fine wire from B (see diagram). Then disconnect the heavy wire from A and solder it to B. Break one of the wires leading to the eliminator, and connect one of the severed ends to A and the other to C. Cut one of the A-battery wires, and connect one of the ends to D, the other to E. Adjust the armature spring at the back of the cut-out by bending, so that the contacts will come together when the A-battery filament switch is closed. By bending the ears on the bottom of the cut-out straight, it can be mounted on a bakelite or hard-rubber base.

A-Supply from Farm Plant

After considerable experimenting, I finally hit upon the idea shown in the sketch for obtaining the necessary 6-volt A-battery supply for the radio set from the 32-volt farm-lighting plant. The control panel consists of three ordinary porcelain lamp sockets and rheostat, mounted on an asbestos panel and wired as shown. The line voltage is reduced by means of the lamp, which is connected in series with one side of the line, and the filament current to the set is then regulated with the rheostat. This device supplies the necessary filament voltage without placing a drain on any individual battery in the bank, which is preferable to the common practice of taking it from one 6-volt unit.—Marion J. Teachout, Martville, N. Y.



When three or more stages of intermediate-frequency amplification are employed in a superheterodyne receiver, the set will work best if the filament supply is kept at minimum; sensitivity is often increased in these stages by reducing the B-voltage.



Remote-Speaker Control, Showing the Jack and Lamp Arrangement for Checking the Distant Speaker

A Handy Speaker Hookup

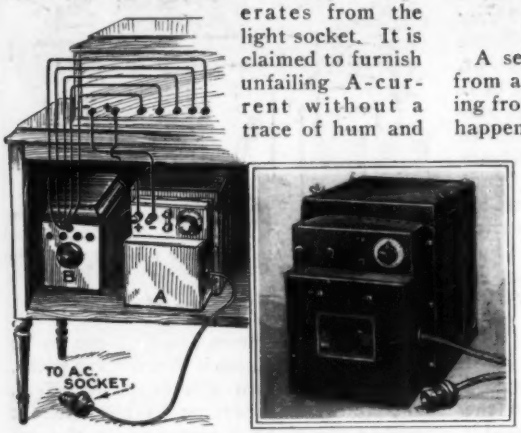
When two or more speakers are to be used and one of them is at a distant point, the hookup shown will prove practical. It enables the operator to use the set speaker alone, both together, or the remote speaker alone, as desired. If the listener at the distant point wishes to cut off his speaker, he can do so without disturbing the speaker at the set. The operator at the latter point can tell whether the remote speaker is in use by the signal lamp, which, when switched across the line to the distant speaker, will not light, owing to the resistance of the speaker winding. If that speaker is disconnected, the lamp will light.

Heavy-Duty Chokes for New Power Units

The increasing power requirements of high-power amplifiers has resulted in greater attention to the current-carrying capacities of chokes, resistors and connecting wires. While 60 milliamp. filter choke coils were more than sufficient to carry the current needs of the average receivers employing one or two of the 171 or 210-type tubes in the last stage, the new 250 or 350-type power tube requires heavy-duty low-resistance choke coils capable of carrying from 100 to 150 milliamp. When designing the filter system for this tube, the high-voltage tap can be taken from the connection between the chokes. With this arrangement, the heavy current flows only through the choke of the first stage of the filter so that a lighter-duty choke can be used in the second stage if desired.

Automatic A-Power Unit

The automatic A-power unit shown in the illustration has a built-in relay and operates from the light socket. It is claimed to furnish unfailing A-current without a trace of hum and consists simply of a storage battery and trickle charger with which is combined an automatic relay switch of some good design. The installation sketch shows the simple connections necessary to place the unit in operation. The storage battery is of a long-life design claimed to outlast several ordinary batteries. The noiseless charging unit provides four graduated charging rates, and, in addition, one booster rate of 1½ amp. for an emergency charge, which enables it to take care of all sizes of sets and conditions of operation. The unit is designed to operate on 110 to 120-volt, 50 to 60-cycle a.c. current.



Left, A-Power Unit, Showing Installation with B-Eliminator, for Complete A.C. Operation of D. C. Sets

Advantages of Push-Pull Amplification

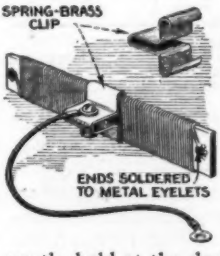
Before power tubes were introduced, when the standard 201 and 301A-types were the only ones available for the last audio stages, push-pull amplification was depended upon to give the best possible reproduction. By connecting two of the A-type tubes in push-pull arrangement, a greater output plus the advantage of freedom from harmonics was obtained, resulting in better reproduction. The advent of power tubes, such as the type 112 and 171 and the still higher 310 and 350-types made push-pull amplification unnecessary from the standpoint of providing the required power output. However, the push-pull arrangement permits simpler design.

A Sensitive Circuit Tester

A sensitive circuit tester can be made from a milliammeter haying a scale reading from 0 to 1.5 milliamp., if such a meter happens to be among the odds and ends on your test bench. Remove the secondary winding from an old a.f. transformer and connect the coil in series with the ammeter and a C-battery. The remaining terminal from the battery and the coil form the test leads. Vary the battery voltage until full-scale deflection is obtained by a short-circuit connection. This voltage will depend on the resistance of the coil and will be somewhere between 4 and 8 volts. The increased sensitivity of the meter will afford better results than the battery and voltmeter combination usually employed. The tester is suitable for locating high-resistance leaks and defective fixed condensers of the low-capacity, by-pass and filter types.

A Handy Resistance Clip

Requiring a small amount of easily variable resistance in the circuit of one of my test-bench meters, and desiring to hold the reading when once adjusted, I resorted to a variable sliding resistance made as shown in the sketch. A strip of 1/16-in. fiber is boiled in paraffin and the resistance wire from an old rheostat is wound on the strip. Either eyelets or Fahnestock clips are employed as terminals for each end of the strip. The clip was made of spring brass, bent as shown above, so as to slide easily, and may be permanently held at the desired resistance value on the strip by means of the machine screw.—Charles H. Willey, West Concord, N. H.



Ballotini Inlays for Boxes

By H. C. McKAY

THERE is use in every household for small boxes of various sizes, such as glove boxes, jewel cabinets, etc.—containers that should be ornamental but which are rarely so. These boxes can be easily decorated in a novel and very attractive manner by the use of "ballotini" or tiny glass beads used for ornamenting of lamp shades and similar articles.

The boxes used may be those of whitewood made for gesso decoration or such simple containers as heavy "natural cedar" cigar boxes.

The first step is the selection of an appropriate design. The nature of this work lends itself to the modernistic patterns which are now in vogue, and there are few mediums that so well express the spirit of this trend as does ballotini. The design should be chosen with regard to the size and shape of the box, unless one is experienced in drawing to an extent which will permit a free-hand reproduction. In any case, the design should be completed upon paper and then transferred to the box by means of carbon paper.

When the design has been transferred to the box, it is carefully strengthened with a heavy pencil, Fig. 1, to prevent obliteration during the carving process. It is then carved in relief in the usual manner followed in wood carving, as illustrated in Fig. 2. The texture of the cigar-box wood lends itself admirably to carving with sharp tools. The design is outlined with a deep single stroke. After this, the background is removed to a depth of about 1/16 in. This may be done roughly, as the inlay will cover all rough surfaces. Care must be taken in cutting the background that a deep grain is not caught which might result in splitting the wood and the removal of an entire piece of the top.

When the background has been re-

moved, all outlines are carefully inspected, and all rough edges trimmed. It is quite important that all edges be practically vertical, sharply defined, and that they run to the entire depth of the cut. This will take a little time. In trimming the edges, be careful not to lift splinters from small isolated portions of the design which are left in relief.

When this is done, the entire design is given a coat of shellac, Fig. 3, the orange variety being quite satisfactory. This shellac coat is a filler coat. It is allowed to become perfectly hard and dry before proceeding with the work. Then a sheet of tinfoil is selected which will cover the top of the box. If a variety of tinfoil can be secured which has an embossed geometrical design, the novel appearance of the work will be enhanced. The foil is laid over the design, as in Fig. 4, and carefully pressed and rubbed down upon it, taking care to see that every detail is fully outlined upon the foil. The foil is then carefully lifted from the box and placed upon a smooth board. With very sharp scissors, the outline of the design is followed, leaving an oversize border, extending about 1/16 in., all around the design.

When this is done, you will have a duplicate of the design, but, due to the fragility of the foil, it must be handled very carefully.

The raised portion of the design is now given a second coat of shellac. When the shellac becomes slightly tacky, the foil design is carefully lifted and placed upon the carved design. (See Fig. 5.) It is carefully adjusted to cover the design exactly and then pressed down to give a perfect contact. This is the most difficult operation in the whole work, as the foil persists in sticking to the design in the wrong place, but with a little care, it can be placed in proper position, and smoothed down until the design shows up clearly and distinctly in the foil. The box is then allowed to dry a second time. The foil is watched during this drying to see that the edges do not loosen and curl up. The foil should extend over the edges of the design and down to the bottom of the cut.

When this is done, the box is ready to receive the background. For this purpose two tubes of ballotini are needed, one of gold and one of iridescent mixture. The background of the design is given a coat of shellac and immediately thereafter a coating of gold ballotini is sprinkled upon the wet surface. (Fig. 6.) This is allowed to set for about ten minutes and then the box is tilted upon its side and sharply rapped against the table top to dislodge all beads which are not firmly held by the shellac.

As the shellac should be really wet when the ballotini

is applied, the top is done in small sections. After completion of the whole top, a period of ten minutes should suffice to insure the adherence of the necessary number of beads. When this is done, the design will be shown in silver relief against a gold background. At this stage the box is set away for twenty-four hours.

The next step is to apply a second coating of shellac by means of an atomizer such as is used by artists for applying fixative to pencil and charcoal drawings. In applying the shellac from the atomizer, it is necessary to protect the design by means of a paper mask, otherwise the iridescent beads would adhere alike to background and design. When the box is thoroughly wet with the sprayed shellac, the iridescent ballotini is applied thinly. This kills the harsh appearance of the gold, leaving the box with a colorful background with gold predominating.

The top design forms the principal part of the box decoration. The box is finished by painting any desired modernistic or conventional design upon it and bronzing this design with decorative bronzes in any desired color. Then, a final coat of white shellac is lightly sprayed over the entire box. This is a protective coat intended to prevent the beads from dropping from the box. The completed box is illustrated in Fig. 7.

This type of decoration may be applied successfully to any wood object, and the novel appearance will well repay the slight trouble encountered in making them.

The materials needed are: the box or other object to be decorated; 1 bottle best white shellac; 1 tube gold ballotini; 1 tube iridescent ballotini; 1 sheet tinfoil; oil colors and decorative bronzes in any shades that may be desired.

Simple Cap Remover

When no bottle-cap remover is at hand one can easily be made in a few moments by drilling a hole through a 6-in. length of wood, about 1 in. from one end, and inserting a round-head screw, letting the head project about ¼ in. below the wood. A nut is driven on the other end of the screw to hold it. —S. A. Gortner, Lancaster, Ohio.

Improvement on an Ordinary Wrecking Bar to Facilitate Removing Siding

Bar for Removing Siding

After having had considerable difficulty in removing siding and roofing boards with an ordinary wrecking bar, without breaking any wood, I devised the bar shown in the illustration. It helped do the work quicker and with less damage, as it is pressed against the board from both sides of the studs. It was made from a wrecking bar and a fork with two tines, about 5 in. apart, which was welded to one end of the bar.—Lovell Cook, Bloomingdale, Mich.

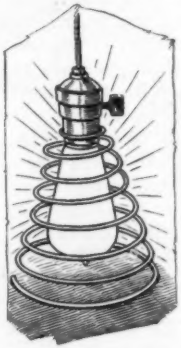
What to Do When an Inner Tube Gets Porous

Every auto owner knows that inner tubes sometimes get more or less porous. This is due to acids forming in the material, especially when the tires have been standing for a long time. To neutralize the acids causing this trouble, wash the tube with a solution of ammonia and water. Take a tablespoonful of French chalk and three tablespoonfuls of the ammonia solution and mix thoroughly, remove the valve and introduce the mixture into the tube by means of a fountain-pen filler. After this has been done, inflate the tube to the pressure of a rubber ball, and coil, rather than fold, it so that the mixture may circulate freely inside of it. If the tube is to be used immediately, this procedure is not necessary. The mixture will not only prevent the tube from becoming still more porous, but it will even seal small punctures for several days. Unlike many preparations often used for this purpose, this mixture will not work itself under existing patches and has no harmful effect on the tire.—George H. Holden, Chesterfield, England.

Short-Stopping Photographic Prints

One of the most difficult problems confronting the amateur photographer who makes his own prints is to give each one the same time in the fixing bath. Usually prints are transferred directly from the developer to the fixer, one by one, as they are printed, and allowed to accumulate there. The result is that the first ones are overfixed and the last ones underfixed, causing yellow discolorations and lack of permanency. The use of a short-stop solution, which stops the action of the developer but has no other effect on the prints, will be found handy, as the prints can be allowed to accumulate in this solution before they are put in the fixing bath. A good short stop, which has been found entirely satisfactory, is a solution of ½ oz. of acetic acid in 8 oz. of water.—Norval Ballard, Virginia City, Nev.

Improvised Lamp Guard



When you need a guard for an electric lamp in the garage, workshop or basement, and have none on hand, an ordinary helical spring, of the kind used in overstuffed furniture and auto seats, is a good substitute. Fasten the spring around the light socket, as shown, and screw in the bulb. Then pull the spring out until it extends beyond the lower end of the lamp.—W. C. Thomas, Chicago.

False Bottom in Pan Prevents Burning Biscuits

My wife had trouble when baking biscuits, as the underside would scorch and burn before the top was properly browned. To eliminate this, I made a false bottom for the pan. It is merely a piece of tin, cut the same size as the bottom and indented with four rows of punch marks so that there would be a slight separation between the two. There were no more burned biscuits after that.—James E. Noble, Toronto, Can.

Advertising Feature on Closed Auto

It is possible to use your pleasure car for business purposes, without marring its appearance, by the application of painted signs. Just paint the advertisement on ordinary window shades and substitute these for the shades of the car, the roller of the window shade being removed and the roller of the car shade being used in its place. Remove the ratchet from the roller and drive a screweye into the stick in the hem of the shade. The latter is slipped over a screwhook driven into the window sill, and the absence of the ratchet allows the spring to keep the curtain taut all the time. The stick in the hem should be a trifle longer than the width of the curtain so that it will be impossible for it to roll around the roller under the tension of the spring.—C. Neiper Bruce, New Castle, Pennsylvania.

Painted Window Curtains Used in the Closed Car for Advertising Purposes

Old Truck Tire with Tread Removed Makes a Good Swing for the Children

Truck Casing Makes Novel Swing

A large truck casing that has been discarded can be used to advantage for making a swing for the children. All you have to do is to cut away all the tread except a portion about 18 in. long. The bead of the tire is, however, left intact. Turn the tire wrong side out, bringing the tread on the inside, and tie it to the limb of a tree with a length of strong rope, as shown in the photo.

To Prevent Accidents on Cellar Stairways

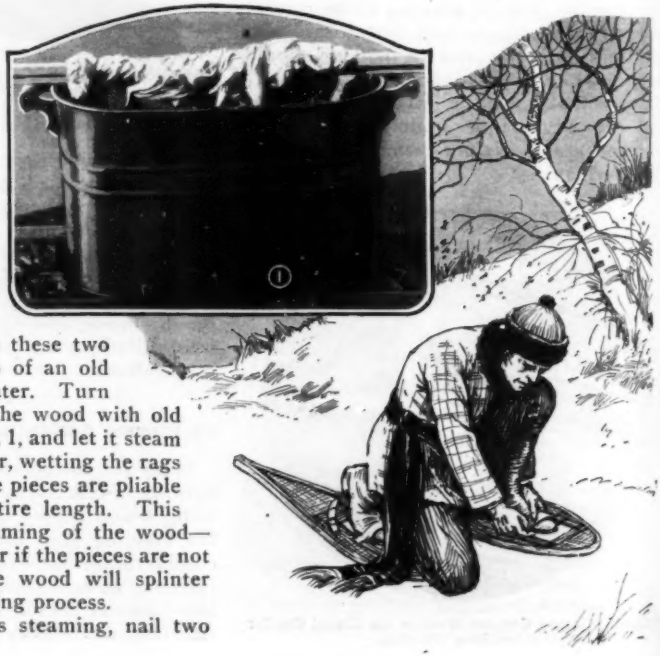
Many serious accidents are due to poor lighting of cellar stairways. This is something which no one seems to improve as the building goes on. Places where no consideration has been given to this feature may be made safer by coating the last two steps or treads with white paint, so that they can readily be seen.

Make Your

MANY persons, even those experienced in home mechanics, look upon the task of making a pair of snowshoes as something very intricate and difficult; a fit job for an Indian or woodsman, but quite outside the capabilities of the average person. Of course, making snowshoes of the traditional rawhide variety is a difficult piece of work, but by substituting ¼-in. galvanized screening (hardware cloth) for rawhide and screws, and bolts and nails for binding, the task becomes comparatively simple.

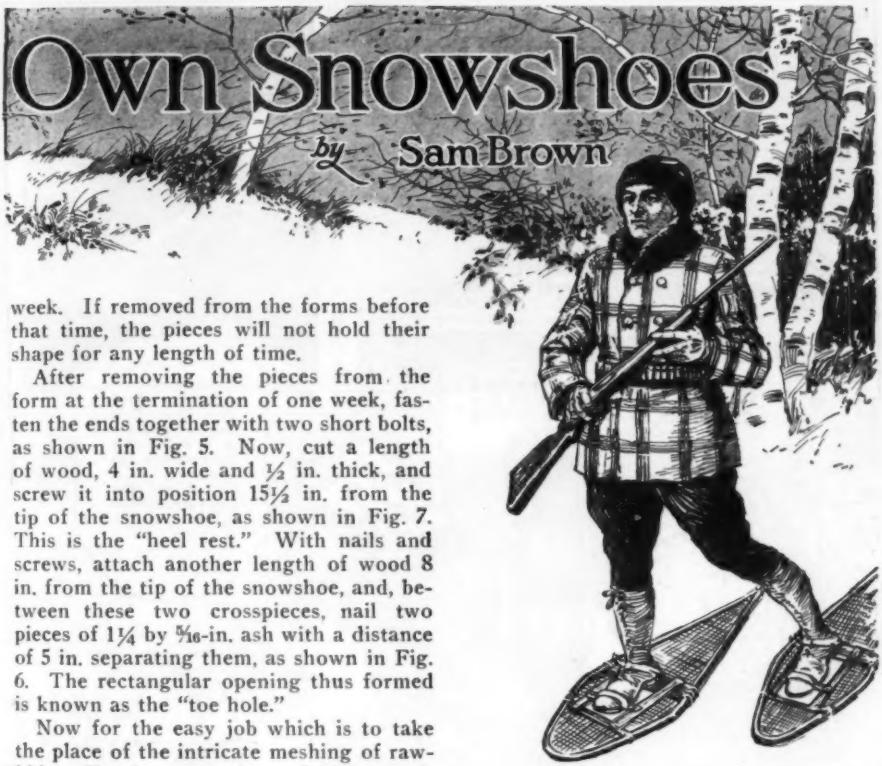
The first thing to do is to procure two 8 ft. 4-in. lengths of ½ by ⅝-in. second-growth ash, hickory, mulberry, or some other pliable wood. Place these two lengths over the top of an old boiler filled with water. Turn on the gas. Wrap the wood with old rags, as shown in Fig. 1, and let it steam over the boiling water, wetting the rags occasionally until the pieces are pliable throughout their entire length. This initial step—the steaming of the wood—is quite important, for if the pieces are not properly treated, the wood will splinter or break in the bending process.

While the wood is steaming, nail two 7-in. widths of 4-ft.-long sheeting side by side, and on this roughly map out the form of the snowshoe, which will be something of the shape shown in Fig. 2, 45 in. long by 14 in. wide at the widest part. After laying out the pattern, nail tin cans and 2 by 4-in. wood blocks to the base to hold the wood to the proper course, as shown in Fig. 3; then remove the steamed lengths of wood and bend them around this form, as shown in Fig. 4. Use large spikes, driving them into the wood base, to check any tendency toward bulging. Bend the second piece over the first one, and set them aside to dry. This takes about one



Own Snowshoes

by Sam Brown



week. If removed from the forms before that time, the pieces will not hold their shape for any length of time.

After removing the pieces from the form at the termination of one week, fasten the ends together with two short bolts, as shown in Fig. 5. Now, cut a length of wood, 4 in. wide and ½ in. thick, and screw it into position 15½ in. from the tip of the snowshoe, as shown in Fig. 7. This is the "heel rest." With nails and screws, attach another length of wood 8 in. from the tip of the snowshoe, and, between these two crosspieces, nail two pieces of 1¼ by 5/16-in. ash with a distance of 5 in. separating them, as shown in Fig. 6. The rectangular opening thus formed is known as the "toe hole."

Now for the easy job which is to take the place of the intricate meshing of rawhide. Simply get a piece of ¼-in. mesh screening and cut it to conform to the shape of the snowshoe, as shown in Fig. 8. The screening should also be cut down the center of the toe hole and the sides bent back and fastened to the sidepieces with short nails driven through pieces of thin wood binding, as pictured in Fig. 9. Short lengths of thin wood should also be used in attaching the screen to the bottom of the snowshoe, as shown in Fig. 10. The slight roughage between the pieces makes for additional footage, although a

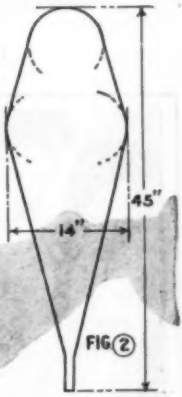
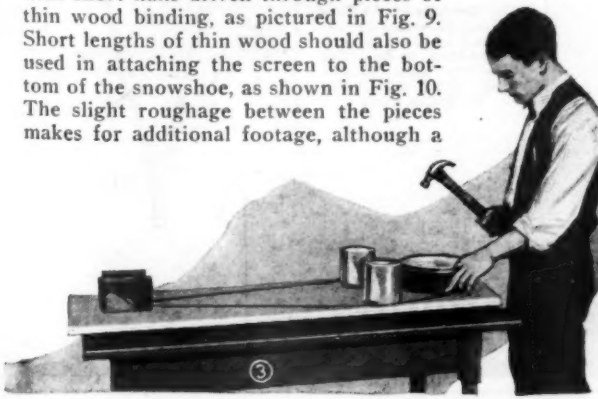


Fig. 2, How the Shape of the Snowshoe Frame Is Laid Out on the Boards; Fig. 3, Tin Cans and Wood Blocks Make the Form around Which the Frames Are Bent

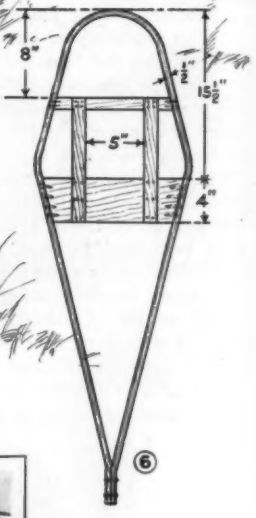


single over-all piece, bent to shape, can be substituted if you desire a neater job.

For foot binding, take a heavy loop of canvas web-

Bending the Steamed Strips around the Form; Note How the Ends Are Carried Past the Wood Blocks for a Greater Bend

After the Wood Has Been Left in the Form for a Week, the Frames Are Removed and Drilled and the Ends Are Bolted as Shown Above



The Rawhide of the Traditional Snowshoe Is Replaced by Galvanized Screening, or So-Called "Hardware Cloth," Cut to Shape with Tin Snips and Tacked in Place

Fig. 9, Tacking the Mesh under Wood Strips to Edge of Toe Hole, and Fig. 10, to Underside of Frame; Fig. 11, the Heel Strap Goes Back of the Heel

allows this to be tightened or loosened at will.

That completes one snowshoe. Make the second one in a similar manner. A trial on these modern snow boats will show you that they serve practically every

FIG. 11

bing of a size just sufficient to accommodate the toe, and nail it across the toe hole, as shown in Fig. 11. A secondary heel strap is then nailed into place. A buckle purpose of the more intricate snowshoes of the Red Men. The toe hole has been purposely made a trifle large because of the fact that it is surrounded by a rigid framework. It should be made smaller or larger, depending on the size of your shoes, but it must be of a sufficient size to allow the foot to sink down into the snow when taking a forward step.

Preventing Penetration of Paste

Stains on wall paper, caused by the penetration of paste, are highly objectionable, especially if the paper has a light color. An effective method of preventing them is to mix 2 oz. of powdered crystal alum in each bucket of paste of the 12-qt. size. Paste so prepared will not soak through the paper and consequently there will be no spotting.

Arrangement for Opening Basement Door

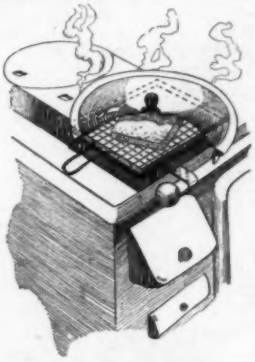
To do away with walking downstairs to open the basement door for the gas, electric and coal men, or others who occasionally have to be let in, I devised the arrangement shown in the illustration, by means of which I could unlock the door from the kitchen. The lock is of the spring-draw-bolt type, such as is often used on garage doors. A length of furnace chain is attached to the handle of the bolt, is run over a pulley on the door casing, and through the floor to a clip on the casing of the kitchen door, which happened to be directly above the basement door. Pulling the chain is all that is necessary to withdraw the bolt. The clip for the upper end of the chain may be fastened to the baseboard, if it is desired not to disfigure the door frame.—M. J. Stair, Chicago.

Suggestions for Your Aquarium

Most aquarium fish die from parasites and diseases, and not from old age. By taking proper care of your aquarium you will have fewer fatalities. The first thing to remember is not to overcrowd it. Two strong, active fish in a 5-gal. tank will thrive, where five fish in a 2-gal. tank may become sluggish and sickly. Pretty stones placed in the bottom of the tank are more or less objectionable, as particles of unconsumed food settle between the stones and decay, which pollutes the water and causes sick fish. It is much better to use sand as uneaten food can then be siphoned off without disturbing or uprooting any of the plants. Siphoning is the proper method of removing water from an aquarium. Fish should be fed only once a day, preferably in the morning. Use a feeding ring and always put this in the same location. The aquarium should be kept in a place where it can get plenty of daylight. However, it should be kept away from the direct rays of the sun, especially during the summer months. Under normal conditions the water in a large tank aquarium need not be changed oftener than once every five or six months. Add only enough water every week to replace that lost by evaporation. A pinch of salt should be added to the water about once a month. This is beneficial to the fish and helps keep down parasites. At least one snail (red ramshorn) should be provided to every gallon of water, to keep the water clean. For goldfish, plants known as swimming arrow-wort should be used, and for tropical fish giant water weed is recommended. Both of these plants can be purchased at any fish store.

Toasting on Coal Stove

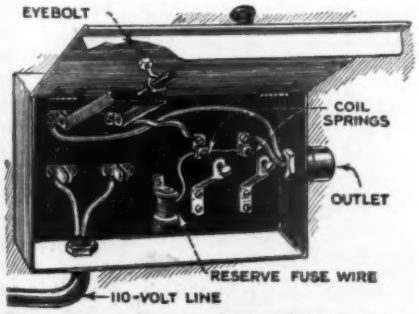
When an ordinary square, flat toaster is placed over an open hole in the cook stove, the admission of air at the top checks the fire, which is not always desirable. To prevent this, place a large pot cover over the toaster, so that it completely covers the hole in the stove as shown. This simple trick is found very effective in keeping up the fire.—Albert E. Jones, Nova Scotia, Can.



A durable pouch for carrying silver can be made by cutting a circular piece of soft leather, 1 ft. in diameter, and punching holes every 2 in. around the outer edge; a drawstring of leather is run through these to close the pouch.

Fuse Box That Throws Switch Automatically

A safety switch and fuse box, which throws out the switch automatically when the cover is raised and contains a roll of fuse wire to facilitate renewal, is shown in the drawing. It is made of sheet metal except the bottom, which consists of slate, bakelite or other insulating material. The cover is hinged to the top edge as indicated, and has an apron which fits over the lower side to prevent anyone from reaching into the box before it is fully open. A d.p.s.t. knife switch is arranged inside, on the slate or bakelite bottom, so that the blades must be pulled up to disconnect them. The handle of the switch is slipped through an eyebolt attached to the cover in the open position. This causes the switch to be opened and closed with the opening or closing of the cover. A spool of fuse wire is mounted inside, on the bottom, so that it can be drawn between the ends of two pairs of copper plates, which are tightened or loosened by means of screws, held by clamps also attached to the bottom. When the section of fuse wire between the two copper plates blows, a new piece is inserted.



Safety Switch and Fuse Box Which Throws Out the Switch Automatically

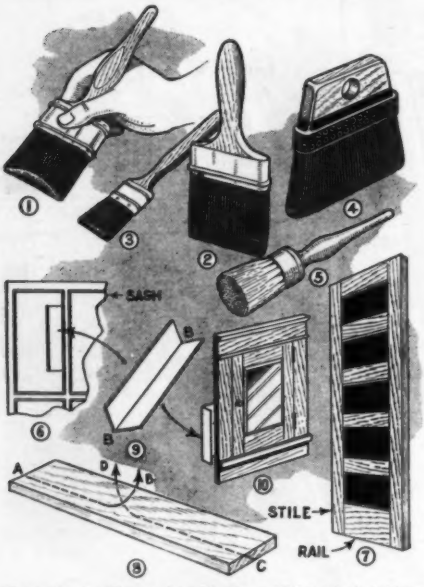
Five-Foot Extension for the Ladder Which Permits the Worker to Reach Otherwise Inaccessible Places

Making the Ladder Longer

When a ladder is just a few feet too short for the job on hand, the 4 or 5-ft. extension, shown in the drawing, will be found handy. It is made of two lengths of 2 by 4-in. stock with 1 by 2-in. crosspieces nailed on both sides. The ladder is slipped between the crosspieces and held firmly by wedges nailed to the sides, hooks being provided to hold the extension on the ladder while the worker carries it from place to place. Strap iron is tacked around the upper crosspieces to prevent them from loosening, as they are subjected to most of the strain, and as many rungs are added below the crosspieces as may be necessary to give the extended ladder the desired reach.—Leon I. Thomas, Oak Park, Ill.

¶A pencil will not fall out of the vest pocket while one is in a stooping position if a rubber band is wound tightly around the lower end; the ball of rubber thus formed clings to the cloth.

Paint Brushes and How to Use Them



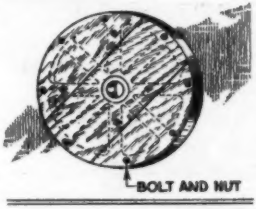
Every Home Owner Should Know What Kind of Paint Brushes to Have and How to Use Them Properly

Every home owner should know something about paint brushes and how to use them, as there will be a time when he wishes to repaint the ceiling, walls, interior woodwork or perhaps some furniture. In the illustration, Fig. 1, is shown the proper way of holding a brush. This method may seem rather difficult and clumsy to the novice, but long practice has proved it to be the best, as it gives the user perfect control of the brush. For general use, the home owner should have a 3½ or 4-in., and a 1 or 1½-in. brush; with these he can do almost any kind of painting on woodwork. For walls and ceilings, a 6-in. flat brush, Fig. 2, is used, and for applying paste to wallpaper, the type of brush shown in Fig. 4 should be purchased. When you do wall-papering you should remember to dust off the wall thoroughly before applying the paper, and for this purpose a round dusting brush, Fig. 5, will be found handy.

When paint is applied to a surface by an amateur, "laps" are often evident. These are caused by stopping the brush abruptly on the surface and thus leaving a deposit of paint at this point. To prevent this, apply the paint as indicated by the dotted lines in Fig. 8, brushing in the direction shown by the arrows. When painting paneled doors, first cover the panels, then the crosspieces or rails, and lastly the stiles. To prevent daubing paint on a finished wall when it is applied to sash or wall trim, take a piece of cardboard, about 6 in. long and 5 in. wide, and fold it lengthwise as indicated in Fig. 9. Hold this shield against the wall and the woodwork as in Fig. 10, and you will have no trouble in painting the wood without getting any paint on the wall. Turpentine cleans brushes that have been used for paint, varnish and stain. Lacquer is made of entirely different ingredients and turpentine will not clean brushes used with these materials. Alcohol or lacquer thinner will serve for cleaning lacquer brushes. After cleaning, the brushes should be washed out thoroughly with soap and water and set away to dry, after which they are wrapped in paper to prevent them from collecting dust.—Francis W. Henry, Pottsville, Pa.

Boxed Wagon Wheels for Mud Roads

In some parts of Mississippi, where logs and lumber are hauled through marshes, wagon wheels are boxed up to prevent the mud from lodging between the spokes, which, of course, makes it extremely hard for the horses to pull the load. The boards used for this purpose are thin and light. They are fastened to both sides of the wheels and are held in place securely by means of screws, nails or bolts driven into the spokes and the rim, the use of bolts being preferable if the spokes are heavy enough to take them without being weakened. It is also advisable to locate the bolts in the spokes as near the hub as possible. Use round-head bolts to fasten the boards to the rim of the wheel, as square-head bolts are likely to catch in stumps encountered in hauling.—Bunyan Kennedy, McCool, Miss.



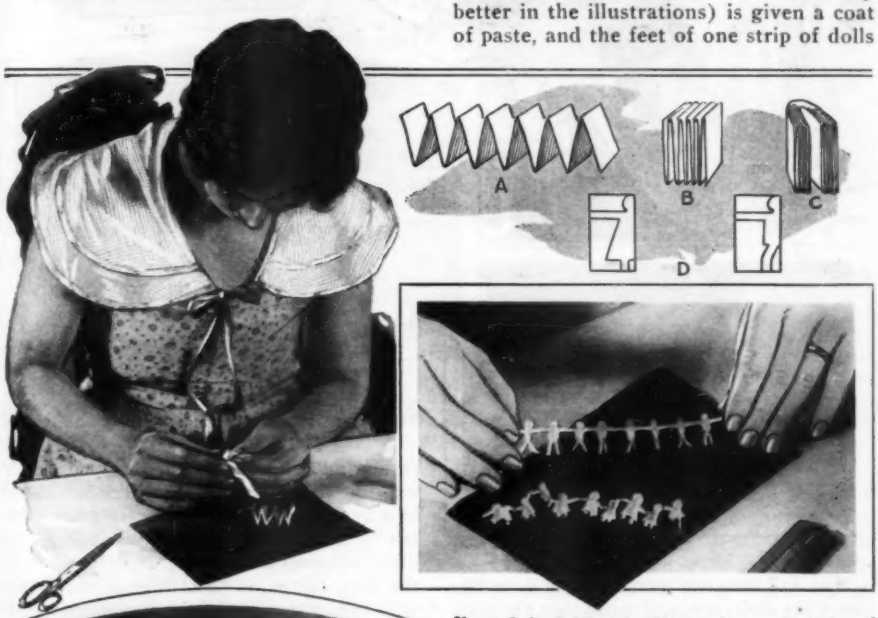
The Magic Ballroom

THE MAGIC ballroom is a simple toy which will provide endless enjoyment to children, and to some of the grown-ups also. The device is based upon principles of static electricity well known to all of us.

The ballroom proper is a shallow box. One of the cedar cigar boxes intended for 25 cigars makes an excellent box for this purpose. In addition, all that is needed is a small quantity of tissue paper, some thin card, a sheet of celluloid as large as the box, paste and tacks.

Two strips of tissue paper are cut about ¾ in. wide and 4 or 5 in. long. These strips are folded back and forth as shown in the illustration, at A. When both strips have been thus folded, the resulting square packets B are folded in the center, as at C, and one each cut as shown in the diagrams at the right and left of D. When the strips are unfolded, you will have two rows of tiny tissue-paper dolls holding hands. These will be of the two shapes shown, one strip of boys and one of girls.

One edge of the thin card (black has been used in this case, in order to show up better in the illustrations) is given a coat of paste, and the feet of one strip of dolls



Upper Left, Folding the Tissue; Above, the String of Dolls after Cutting Out; Left, Pasting the Dolls to the Edge of the Thin Card

pasted upon this card, the feet extending over the card about ⅛ in. This is to provide the feet with a certain amount of weight to hold the figures upright.

With sharp scissors, cut this narrow strip from the edge of the card. Then the card is carefully cut along the outlines of the feet. When this is done, each foot will have a piece of cardboard about ⅛ in. square pasted upon its extremity. The strip is now held above the box and the hands of the dolls cut apart, allowing each

Upper Right, Cutting the Dolls from the Strip; Below, Tacking the Celluloid Cover in Place; Left, How the Dolls Are Made to Dance in Their Ballroom

doll to fall into the box. This is done because the dolls are so fragile that they are handled only with difficulty.

About five boy and five girl figures will be enough for the box. The sheet of celluloid is now fastened to the top edges of the box with fine tacks or nails. This completes the toy, unless the constructor desires to ornament the outside of the box. The simplest way to do this is to stain the box, then glue on a cut-out of a couple dancing, and give the box a coat of varnish or clear lacquer.

If the finger tip, or a piece of silk held in the fingers, is rubbed across the celluloid once or twice, the dolls will jump upright, and if the box is then tapped gently with the fingers, the dolls will dance about in a lively manner. As the charge of electricity generated becomes dissipated, the dolls will waver and drop to the floor of the box, but a single stroke of the finger will bring them upright again, some of them leaping up and hanging suspended by their heads.

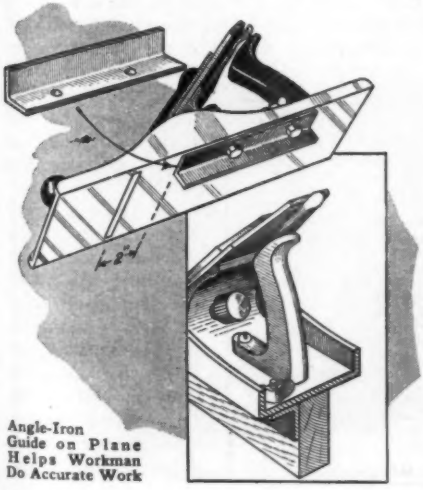
Thawing Out Frozen Auto Radiators

The quickest way to thaw out a frozen auto radiator is to pour hot water on the outside. Do not make the mistake of pouring the hot water into the radiator, as this will have little or no immediate effect. Pour the water around the tubes after having opened the drain cock. If steam is available, it can be used to greater advantage in the same way, but if there

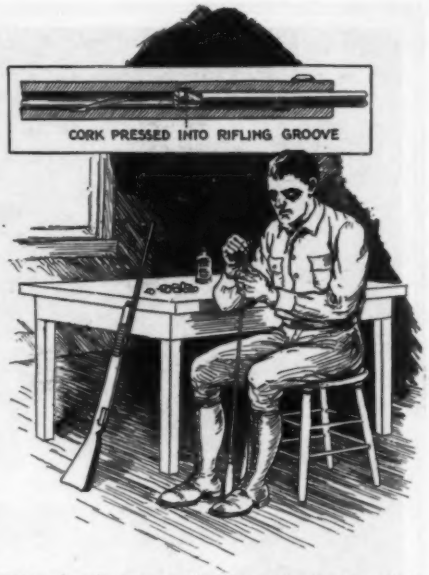
is no steam or hot water, throw a heavy blanket or cloth over the radiator and run the motor slowly, preferably with the fan disconnected. Take care, however, that the motor does not get too hot, or serious damage may result. If the sediment bulb under the gasoline tank becomes filled with water and freezes, soak a heavy piece of cloth in hot water and wrap it around this part until it thaws out. If water collects in the carburetor and freezes, the carburetor should be treated in the same way. Trouble of this kind causes difficult starting in cold weather, and a hot bath, such as just described, will sometimes do a lot more good than hours of cranking.—Glen F. Stillwell, Collinsville, Ill.

Detachable Plane Guide Aids in Squaring Work

In order to plane the edge of a piece of wood at perfect right angles to its face, the guide shown in the illustration will be found useful. It consists of a length of angle iron attached to the underside of the plane and parallel to its edge. Two holes are drilled through the guide and through the bottom of the plane to accommodate screws, which are held in place securely with wingnuts. The ends of the guide are slightly rounded to prevent marring the work. By tilting the blade the edge of the work can be cut at a slight bevel.—Albert Armyn, Astoria, N. Y.



Angle-Iron Guide on Plane Helps Workman Do Accurate Work



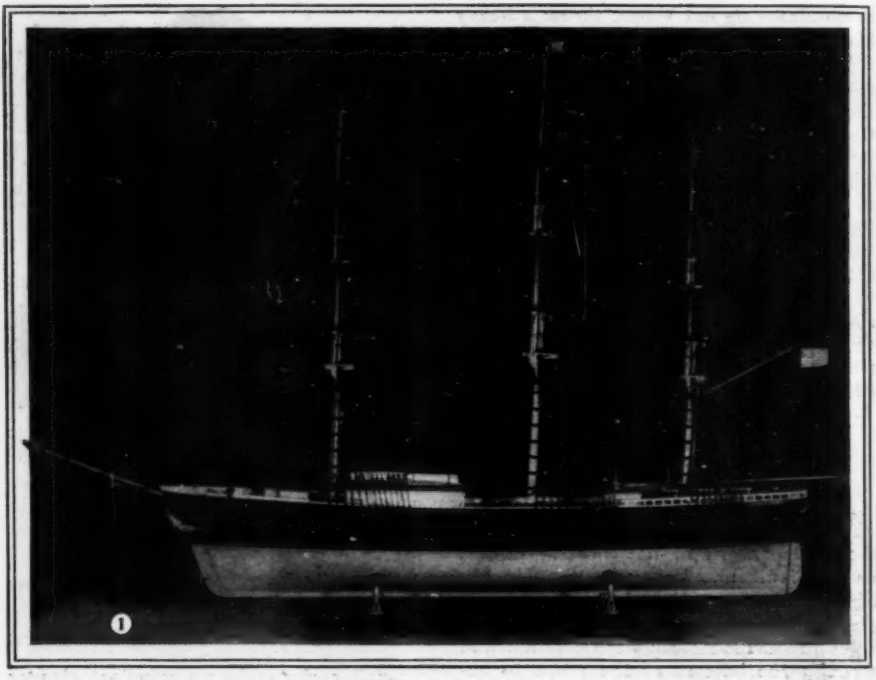
Rifles Can Be Thoroughly Cleaned by Pushing Corks through Them

Small Corks Used for Cleaning Rifle Barrel

Small corks make an excellent cleaner for rifle barrels. They should be slightly larger than the bore of the rifle and the larger end is pushed in first. The pressure of the ramrod against the cork will expand it slightly so that the rifling groove will be cleaned too. It has been found best to enter the cork at the breech end of the gun if its design permits. Small corks that are suitable for .22-caliber rifles, can be bought for a few cents, and larger ones for larger-size guns do not cost much more at groceries or drug stores.—Dick Cole, Los Angeles, Calif.

How to Clean an Electric Percolator

It is an easy matter to clean the inside of an electric coffee percolator. Put four heaping tablespoonfuls of salt in the coffee compartment, and fill the percolator with about as much water as when making coffee. Then put on the fire to boil and let the percolation go on for some time. This will remove the deposit on the interior and it will be found also that any grains of coffee which may have lodged in crevices have been loosened.



The "Flying Cloud" Contest

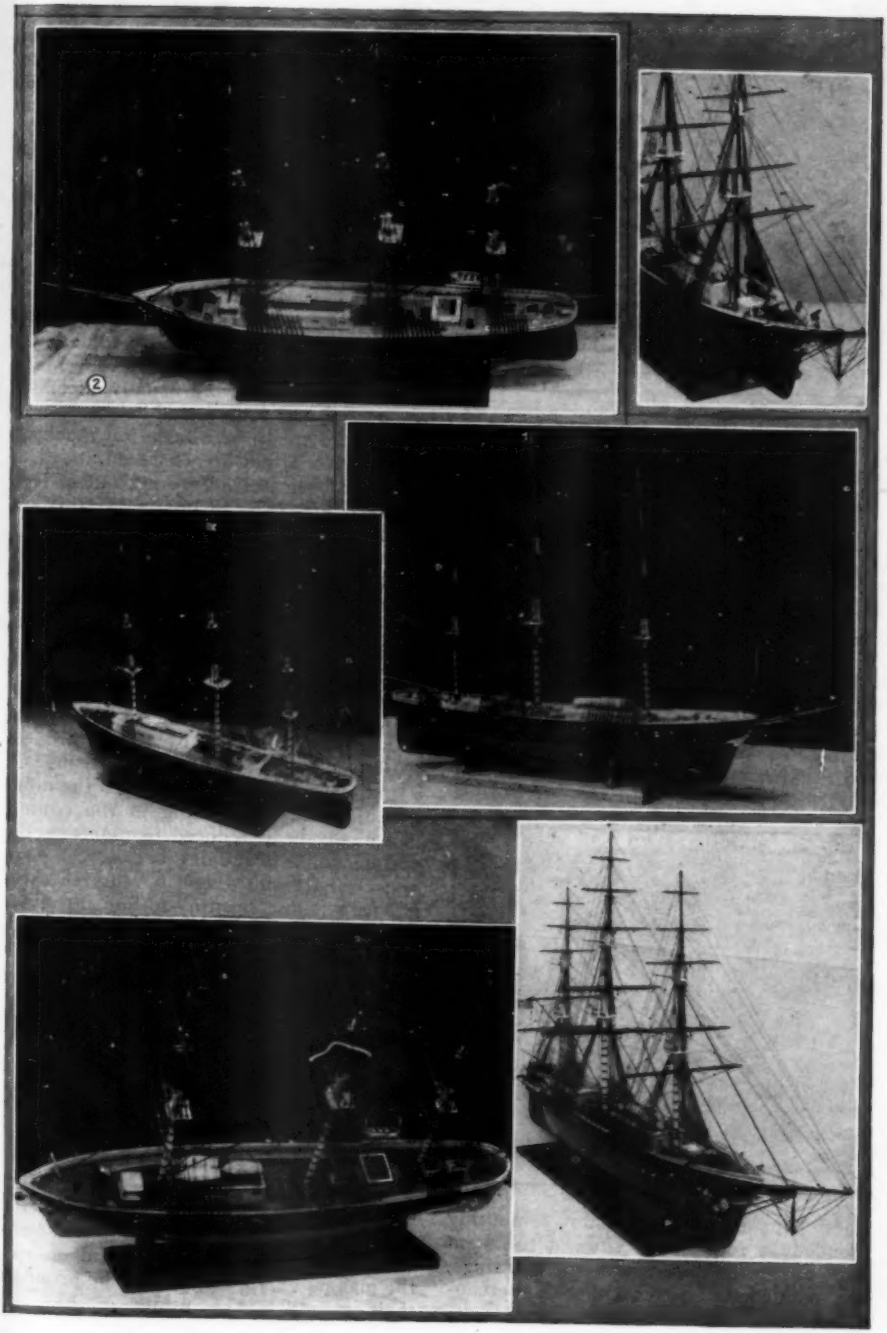
THE OUTCOME of the "Flying Cloud" contest was highly gratifying, as well as surprising. Surprising because of the general high quality of the models entered, and gratifying because of the large number of entries received. It may seem rather strange that the judges were surprised at the quality of the models, but, when it is considered that over ninety per cent of the contestants lived in inland towns, and had never seen a ship of any type, except in pictures, the reason for the reaction may be understood. Out of a total of 263 entries that arrived before the closing date, only four models could be considered as poorly executed. The remainder, of course, fell into several classes: excellent, good and fair. Even the fair models, however, were excellent examples of the modeler's craft, as compared with the models one sees offered for sale in the stores, or compared with the models one occasionally sees exhibited as the work of an "old salt."

PRIZE WINNERS

1st, D. P. Brown, Dorchester, Mass.
2nd, Ivar Nordstrom, Falconer, N. Y.
3rd, L. J. Pitcher, Chicago, Ill.

E. A. Gahl, Wauwatosa, Wis.
Dr. M. L. Rush, Meridian, Wis.
A. E. Warren, Burlington, Vt.
J. R. L. Hughes, Brownsburg, Ind.
G. F. Umpleby, Baltimore, Md.
W. G. Ahlers, Lansing, Mich.
Aug. Nelson, Portland, Oreg.
Fred. A. Craven, LaPorte, Ind.
E. R. McCarthy, Seattle, Wash.
W. F. Hillier, Lowell, Mass.
R. M. Johnson, Kansas City, Kans.
Oliver I. Ryon, Higganum, Conn.
A. C. Rymer, Washington, D. C.
Marshall M. Davis, Plainfield, Ill.
C. E. Marshall, Rockland, Me.
W. J. Herz, Reno, Nev.

In judging, all small negatives were enlarged to a standard size, so as to give all contestants as equal a chance as possible, and the models were judged on the following scale: Accuracy, 30 points; general ap-



pearance, 20 points; workmanship in deck fittings, 20 points; rigging, 20 points, and masts and spars, 10 points. The workmanship on the hull was considered in judging for accuracy, since the quality of the hull depended on the fidelity of the hull lines.

The faults most frequently found in the hull lines were the following: Too much or not enough sheer; line of sheer not smooth from end to end; line of bulwark curve uneven and bumpy; not enough flare at bow; bow cut down too sharp; stem inaccurately shaped; curves under counter too abrupt; stern too pointed or too square; too much "daylight" between rudder and sternpost, in other words, a

poor fit; hull curves not smoothly blended; a few photos showed the stem lines out of plumb. In the deck fittings, the main faults found were with the capstans, which were usually too clumsy; paneling on deckhouses unevenly done and streaky, and occasionally one or two deck fittings were mispiaced. The workmanship on the fittings, on the whole, was of a very high order.

The rigging was uniformly good. The faults found here were: Halyards improperly led; lanyards twisted; sheer poles omitted; upper stays slack; brace purchases twisted; backstays set up too tight, pulling masts out of line; lead of headstays wrong; chain tyes too heavy; some lower stays were not doubled. Masts and spars were usually excellent, the commonest fault found being that the spars were apt to be a little too much tapered. No attention was paid to yards that had been slewed around out of line, as the judges realized how easily this can be done accidentally while photographing. Some photos showed bad alinement of the masts, but mast and yard fittings, cranse irons, jackstays, etc., showed that most of the builders were expert with the soldering iron.

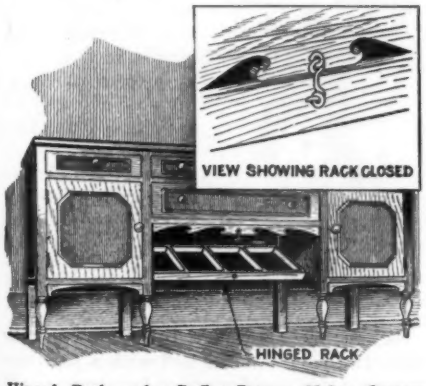
The original list of prizes consisted of three major awards of $100.00, $50.00 and $25.00, with gold, silver and bronze medals, respectively, followed by five awards of $10.00 and five of $5.00, with bronze medals, a total of thirteen prizes. When the number of models remaining in the contest had finally been reduced to nineteen, the real hard task of judging began. All were first-class examples, and it required careful, painstaking scrutiny to find the slight flaw in each one that relegated it to the background until the three winners were left. Then these had to be weighed and compared closely, point by point, until they were placed in the order of their merit. After the first three had been picked, it was found that there was nothing to choose between the remaining sixteen entries, so, in fairness, all were awarded $10.00 and the bronze medal. A few of the prize-winning models are shown here, the first three being numbered in the order of the awards. It is unfortunate that the pictures do not begin to do justice to the excellence of these beautiful models, the makers of which may well be proud of their splendid workmanship.

Keeping Brooder House Free from Rats

One of the best methods of keeping rats out of a brooder house is to break old pieces of glass into pieces about ¼ in. in size, and lay these on the ground outside of and next to the brooder house. The strip of ground covered with glass should be about 12 in. wide. Rats will not cross the glass barrier as they cut their feet in doing so, and I have found that they will not dig under it. Be sure not to trample the glass into the earth. When no longer needed, the glass can be swept up and put away until its use is again necessary.—Luther Strosnider, Onaga, Kans.

Storing Asbestos Table Mats

Asbestos table mats can be conveniently stored, out of sight, on a light wooden rack hinged to the back of the buffet, a few inches below the center drawer, as shown in the illustration. The rack is made of 1 by ¼-in. hardwood strips, and a small hook, attached to the underside of the drawer, holds the rack in position when the mats are stored on it.—S. A. Pease, Wauwatosa, Wis.

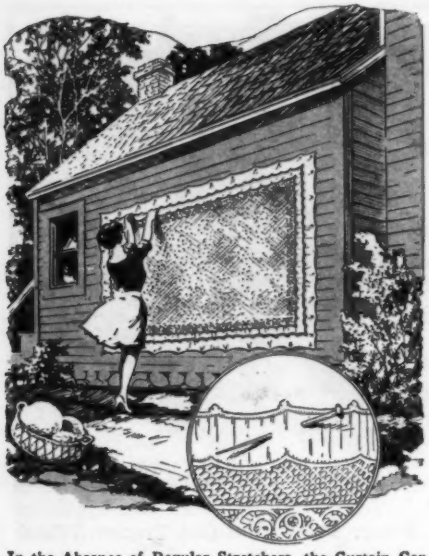


Hinged Rack under Buffet Drawer Makes Storage Place for Table Mats

Old Tractor Wheel Belted to Small Generator Provides Electricity for the Farm House

Power Plant from Old Tractor Wheel

Used in conjunction with a concrete dam, an old tractor wheel makes a good water wheel, and has been found capable of delivering enough energy to supply electric current for a farm home, tests showing that approximately ½ hp., or about 350 watts of electrical energy, are generated. The wheel is 5 ft. in diameter, and the blades, twenty in number, are 10 in. high and 20 in. long. Each blade is braced with lengths of light strap iron, both being held by small bolts. A turned steel shaft of suitable length runs through the hub, the shaft being keyed in place, and rests in two babbitted bearings. A pulley, 3 ft. in diameter, is keyed to one end of the shaft, and this is belted to a 1-in. pulley on the generator shaft. When the water wheel makes one revolution per second, the speed of the generator is 2,000 r.p.m. The latter is housed to protect it from the weather, and is set high enough so that occasional flood water will not reach it. Storage batteries are used to "float on the line" in order to supply a steady current and to provide a reservoir for slight overloads. The flume, made of concrete, is a little wider than the wheel, so that all the energy possible is obtained, which would not be the case if the flume were narrower than the wheel. A spillway is provided at the other end of the dam.



In the Absence of Regular Stretchers, the Curtain Can Be Mounted on the Side of the House

Improvised Curtain Stretcher

One woman who wanted to wash her lace curtains but had no stretcher, solved the problem in a very simple way. She merely tacked a bed sheet to the side of the house and pinned the curtains to it as shown. After they had dried, the curtains were just as good as though a regular stretcher had been used. Of course, the bed sheet is not essential; any large piece of clean cloth will do, provided it is larger than the curtains.

Spark Plugs Often Cause of Missing Motor

When your auto misses determine first of all whether the miss is steady or irregular. An irregular miss had best be left for an expert to find and remedy, but a steady miss is usually easy to find, and it should be remedied at once as uneven running soon damages the motor. When the miss is steady, short-circuit the spark plugs one by one while the engine is running slowly. Use a screwdriver to do this, being sure to hold the blade against the cylinder wall or against any metal part of the motor, and then, while keeping this metal contact, swing the blade over so that it almost touches the top of the spark plug to be tested. When the gap between the screwdriver blade and the end of the spark plug is about ⅛ or 3/16 in., a spark should arc across it regularly. If no spark is noticed, the spark plug is most likely short-circuited inside and should be removed and cleaned thoroughly, or replaced with a new plug. If the blade of the screwdriver is actually touched to the end of the spark plug while testing the latter, it will prevent the spark plug from functioning at all. When you touch a plug in this way and you notice that the motor runs still more unevenly, the spark plug is evidently in good condition. But if it makes no difference in the running of the motor, the plug is defective or dirty, or the valves in that cylinder are not properly seated. If, after the above tests, you are still in doubt as to what plug is causing the trouble, remove all the plugs, and their condition will betray them. If they are wet with oil and gasoline or heavily carbonized, they cannot perform perfectly. It is a good idea to keep an extra plug on hand so that when trouble is experienced a spare plug can be installed until there is leisure to clean the dirty one.—Glen F. Stillwell, Collinsville, Ill.

Repairing Bath Spray

To prevent a bath spray from coming off the end of the rubber tubing, as it often does when the water is turned on full force, try the remedy shown in the illustration; simply cut off a ¾-in. piece of the tubing and slip it over the end of the latter, as shown. Then a double thickness of rubber will hold the spray securely.—R. B. Ware, Wadsworth, Ohio.

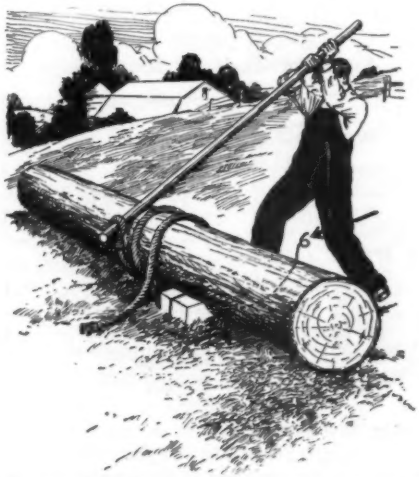
Eliminating Bedbugs

When bothered with bedbugs, rub the slats and joints of the bed with a mixture consisting of equal parts of turpentine and kerosene. Where there are many bugs

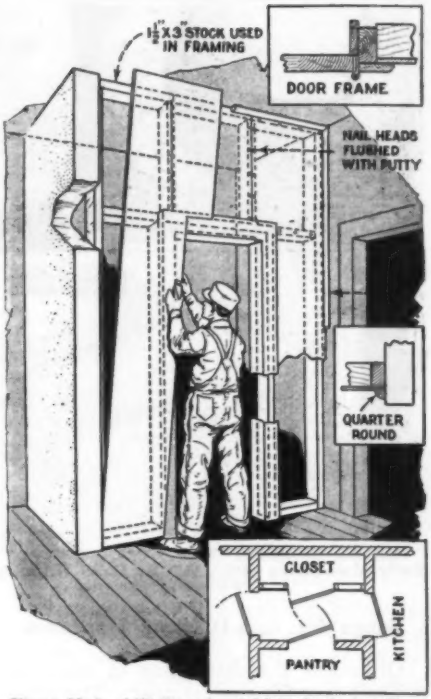
squirt the mixture into every crack in the room. An oilcan is useful for this purpose. To prevent more bugs from invading the bed after the treatment, set the legs in fruit-jar lids containing some of the mixture.—A. T. Bowden, Ottawa, Kans.

Rolling Heavy Logs Single-Handed

You can roll a heavy log single-handed on level ground or up a slight grade by the method shown in the illustration. The device used for this purpose consists of a stout pole or iron pipe, about 2 in. in diameter, a length of heavy rope, about 15 ft. long, a block, and a length of light rope such as sash cord. The heavy rope is snubbed a few times around the log so that the pole, which is slipped through a loop made at the end of the rope, is in the position indicated. Pulling down on the pole will roll the log toward the worker. After the pole has been pushed down as far as possible, the block is pulled up against the log to prevent it from rolling back again. In order that the worker may be able to pull the block up every time the log is rolled forward, the light rope is tied to the block, this rope being slipped under the log before starting the work. For the second and subsequent "bites," the heavy rope must, of course, be readjusted.—Sam Weidman, Lowell, Wash.



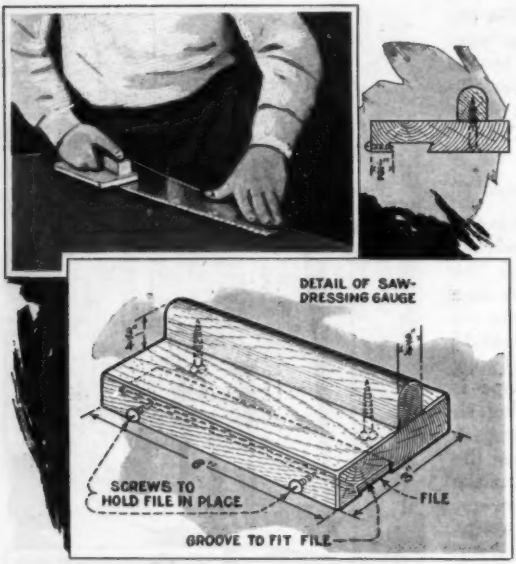
One Man Can Roll a Heavy Log Uphill or on Level Ground by This Method



Closets Made of Wallboard and Light Studs Are Cheap and Easy to Put Up

Wallboard Used for Making Closets

The owner of a Washington home requested several contractors to give estimates on closets in some rooms of his residence. One of them offered to make them at $15 each, and this figure was about one-third the estimates of the others. The reason for this was that the use of wallboard was suggested by the low bidder, and the construction of the closets was so simple that every home owner who is handy with tools can build them himself. The framing consisted of 1½ by 3-in. studs, widely spaced, but nevertheless making a rigid structure for the purpose, and resulting in less wasted space than would be the case if 4-in. studs were used. The doors were bought secondhand. In mounting the wallboard two sections were cut out to make one side, the joint being made over the door as shown in the illustration. The corners at the wall were finished with quarter-round stock. No interior finishing was desired.



Easily Made Device Which Will Be Found Helpful in Properly Side-Dressing Handsaws

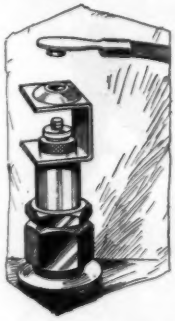
Gauge for Side-Dressing Handsaws

Ordinarily the sharpening of saws is a difficult task for the amateur. The accuracy and smoothness with which the sharpened saw cuts depends as much on the operation of side dressing as it does on the filing of the teeth. A slight variation in the setting of the teeth causes the saw to cut roughly and to "run," and it is therefore necessary to side-dress them with a slightly worn file. Doing this by hand is not likely to produce an accurate job as it tends to dress the teeth unevenly. It is much better, therefore, to use the gauge shown in the illustration. It consists of a hardwood block, with a groove plowed on one side to receive a file or a piece of a file, which is held in place by means of two brass screws inserted in the edge of the block at right angles to the groove. A handle is attached parallel to the groove which holds the file. Tilting the gauge so that the block does not ride on the saw destroys its efficiency. The difference between the depth of the groove and the thickness of the file represents the amount of set that will result. In case the gauge is to be used for saws needing varying degrees of set, simply cut the groove deep enough to take care of the greatest set, and use shims to raise the file for the smallest set. Saws to be used in dry hardwood require very little set, while saws that are to be used in soft, wet wood need more set, besides having coarser teeth.—K. L. Julson, Butte, Mont.

Phonograph Crank for Winding Spring of Movie Camera

The writer makes extensive use of a small movie camera in which the film is drawn through the shutter by means of a coiled spring similar to a clock spring. It is necessary to rewind the spring at the end of each 40 ft. of film exposure, and for this purpose a small hand key is provided. Rewinding the spring with this key is a slow procedure and rather tiresome on the wrist. A phonograph crank, altered to fit the socket of the movie camera, was substituted, and the rewinding can now be done in about one-tenth of the time otherwise required. To make the phonograph key fit the winding socket, the threaded end of the key was cut off and filed square to the same size as the regular winding key of the camera.—John Edwin Hoag, Honolulu, H. T.

Snap Terminals for Spark Plugs



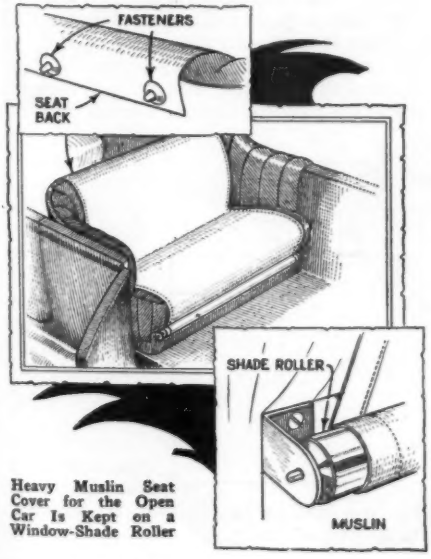
Auto-curtain snaps can be used to make terminals for spark plugs as shown in the drawing. Besides being quickly attached or removed, these terminals are especially useful as they do not loosen under heavy vibration. One part of the snap is soldered onto the wire terminal of the plug, while the other part is soldered to a small piece of brass, which is bent to the shape indicated and securely attached to the spark plug.—H. H. Hoover, Chickasha, Okla.

Screen Keeps Gravel Out of Roof Gutters

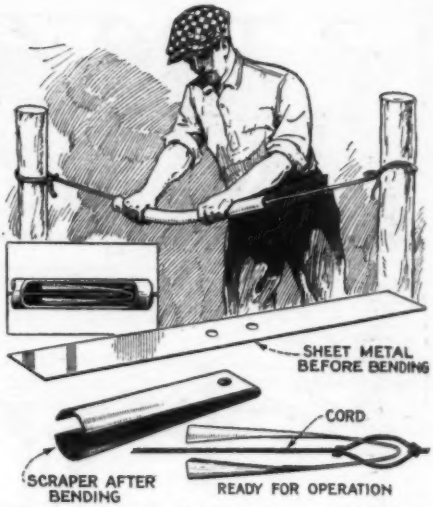
Roofs on many factories and homes have very little pitch, and in many cases the heavy tar paper is covered with a combination of slag and pitch. Although this makes a good roof, the slag often gets loose and is carried down into the gutters, clogging the entrance into the downspouts. The result is that the rain runs over the edge of the gutter and down the side of the building, often entering it and causing damage to the interior. We overcame this trouble by providing a screen guard on the lower edge of the roof to prevent the slag from getting into the gutter. A collection of slag against the screen, however, did not prevent the rain from seeping through it into the gutter.—O. S. Sprout, Lancaster, Pa.

Shade Roller Holds Auto-Seat Cover

To provide clean and dry seats for the open car the roll-away cover shown in the drawing will be found convenient. It consists of a piece of heavy muslin, large enough to cover the seat. One edge is tacked to a shade roller which is mounted on brackets attached to the front, lower part of the seat, as indicated. The other edge has eyelets to fit snap fasteners attached to the back near the top.



Heavy Muslin Seat Cover for the Open Car Is Kept on a Window-Shade Roller



Clogged Automobile Exhaust Pipes Can Be Easily Scraped Clean on This Handy Device

Simple Device for Scraping Carbon from Exhaust Pipes

Cleaning out an automobile exhaust pipe from end to end, removing all the carbon, can be readily done by means of the device shown in the drawing. A strip of sheet iron is bent to a U-shape, the free ends being curved to fit the inside of the pipe. Holes drilled through the scraper, near the bend, provide for tying it securely in the center of a length of rope as indicated, the ends of the rope being fastened to suitable supports. In use, the exhaust pipe is slipped over the rope and the scraper, and by moving the pipe back and forth, the carbon will be removed in a short time.—G. A. Luers, Washington, District of Columbia.

A Good Silverware Polish

Powdered chalk is the principal ingredient in nearly all semiliquid polishes, as the chief purpose of a polish is to act as a gentle abrasive. A good silver polish consists of equal parts of powdered chalk and hyposulphite of soda, well mixed in distilled water. First add just enough water to the powder so that the mixture makes a sort of mortar, then gradually add more water until it reaches the consistency of a paste. In this form it is most suitable for the purpose.

Simple Wooden Vises That Are Cheap to Make, Easy to Install and Hold the Work Securely

Simple Vise for Workbench

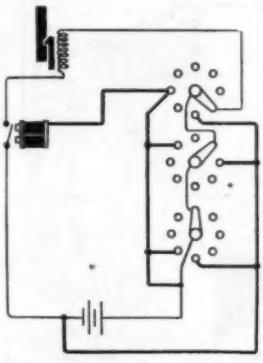
In my manual-training department, I have met the need for simple vises on the workbenches as shown in the illustration. A similar vise can be installed on almost any home owner's bench at almost no expense. Each vise consists of a crosspiece projecting from the side of the bench top about 8 in. or 1 ft., the crosspiece being nailed or bolted on the underside. In case two vises are used, one on each side of the bench, a single crosspiece will do for both. A 10-in. length of 2 by 6-in. wood is sawed in half diagonally, one-half being nailed to the end of the crosspiece as indicated and the other piece being used as a wedge.—L. B. Rogers, Toungoo, Burma.

Trimming Saxophone Reeds

Players of the saxophone, clarinet, oboe and other reed instruments often find difficulty in preventing the cane reeds from splitting during the process of trimming them with a pair of scissors or a knife. To avoid this splitting, trimming by burning the edge off will be found highly satisfactory. Take a small metal disk and hold it against the reed with a pair of pliers, letting the portion to be trimmed off project over the edge. With the disk on the underside, hold a lighted match below it so that the flame burns off the projecting part of the reed.—Thos. Goudie, Kirkcaldy, Scotland.

Fool-Proof Door Lock

On page 328 of the August, 1928, issue of Popular Mechanics was described an electric door lock operated by inductance switches set at a certain combination to complete a circuit. However, this lock is not foolproof, as it can be opened by using three pieces of bare copper wire and putting them against each of the three dials so that they touch every contact point and also the switch lever. A complete circuit is then established and the lock will operate. To overcome this trouble a device might be used to prevent opening the lock by causing the circuit to break when any two of the contacts are connected. Get an old electric bell, remove the coil lead that is grounded to the frame and connect it to one of the contact points as shown in the diagram. This contact point is connected to any contact on each of the other switches, and to one side of the battery. The armature is then connected in the circuit as shown. If the contacts on any one of the switches are short-circuited, the coils on the reconnected bell attract the armature and the circuit to the lock will be broken.—E. F. Seaman, Birmingham, Ala.



SHOP NOTES

All Shop Notes published in 1928, in book form—Fifty Cents—from our Book Department

Dadoing on Small Power Saws

A SIX-INCH dado head, cutting grooves from ⅛ to ⅝ in. wide, will be found a very useful addition to the equipment of the small power saws and "home workshops" now so deservedly popular, as it saves a lot of hand work. On narrow stock, the crosscut guide furnished with the machine forms a convenient and sufficiently accurate guide for use when cutting across the grain, but, when the worker finds it necessary to dado across boards of 8 or 10-in. width, the ordinary crosscut guide is useless. The tongue of the guide is so short that it barely enters the groove in the table, and consequently it is almost impossible to guide the work properly to insure a square cut. It is, of course, easy enough to fit a longer tongue, but a better attachment for the purpose is the auxiliary table shown in the illustrations.

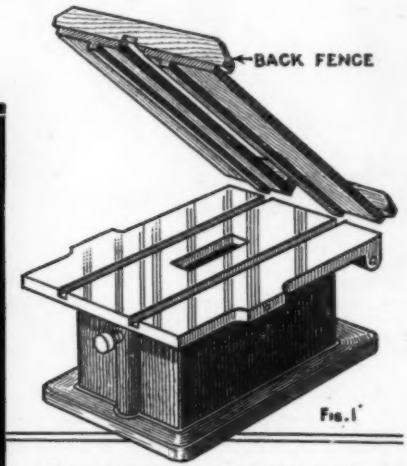
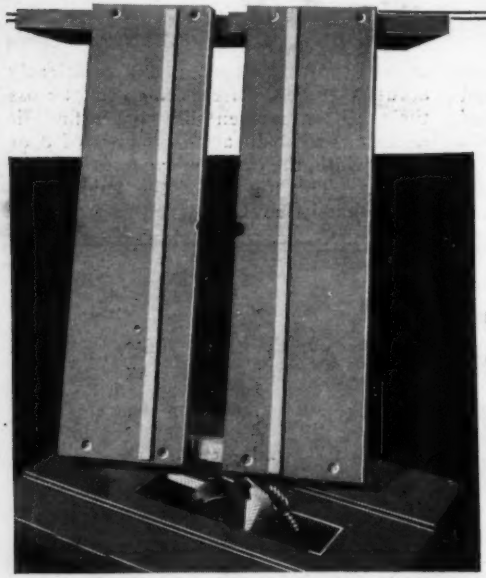


Fig. 1. Saw Table with Finished Auxiliary Table above It; Left, Dadoing with the Table; Note the Lines Squared across the Work

From a piece of well-seasoned hardwood, ½ or ¾ in. thick by 11 in. wide, rip out two pieces 16½ in. long. These sizes are given for a 12 by 16-in. saw table, and may be increased or decreased to suit. Plane the pieces true and out of wind. Cut two fences out of the same material, one 2½ in. wide, the other 2 in., 16 and 12 in. long, respectively. Cut two hardwood strips, the same width and thickness as the guide grooves in the saw table, and make them a good fit in the grooves. Lay the strips in the grooves, with the 5½-in.-wide pieces on top of them. Keep the latter pieces 1 in. apart and parallel to the saw, and mark the position of the strips. Glue and brad the strips to the underside of the pieces. (See Fig. 1, and photo to the left of Fig. 2.)

Drill the pieces for No. 12 screws to hold the fences, and counterbore on the underside for the screw heads. Center the wide fence on the table pieces, at the front end, and set one screw, making it fairly tight. Set the assembly on the saw table and square the fence carefully with the saw. Tighten the screw when square, then clamp the work and drive home the remaining screws; next screw on the narrow fence at the other end of the table; this need not be squared with the saw.

Put the dado head on the machine, set for the widest groove it will cut; set the auxiliary table in place, and run the dado head through both fences, so as to cut a groove, about ¾ in. deep. In line with the right-hand edge of the groove in the wide fence, looking from the saw side,



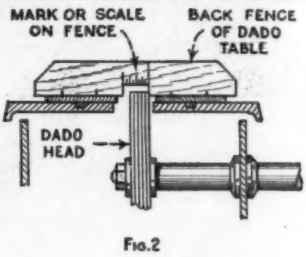


Fig. 2

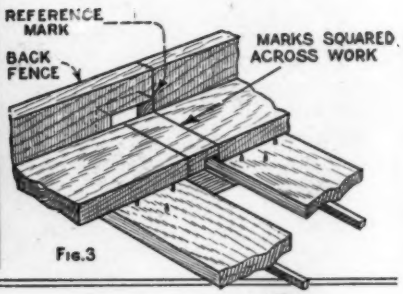


Fig. 3

Fig. 2, Section through Saw Table, Showing Relation of Dado Head to Fence; Fig. 3, Cutting a Wide Dado in Two Sections

run a knife and pencil mark across the fence to serve as a reference mark. Drive a few small brads into the surface of the table pieces, cut off the heads, and file to points, as shown in Fig. 3. These are not essential, but are an aid in holding the work.

When marking off for dados, the lines must be squared across the side opposite to that on which the dado is to be cut. Then, if the work is set against the back fence with the line to the reference mark on the fence, the dado will be cut in the proper place and square across the work. If wider dados are to be cut than the largest groove for which the dado head can be set, the reference mark is useful again, as, after the work has been run over the dado head once, cutting out part of the groove, the work may be shifted endwise and run over again, measuring to the reference mark for the second and succeeding cuts. An improvement on the simple reference mark would be a portion of an old rule let into the fence, with one of the inch marks on the edge of the groove, but the simple mark will serve well enough for occasional work.

Squaring Up the Back Fence with the Dado Head before Screwing It Fast; This Is Important

A reference to the accompanying illustrations will make the construction and use of the table clear. A little alteration in design may be necessary for different saws; for example, on some home workshops, the saw is set near the left-hand edge of the table, as in the illustration below Fig. 3, and there is a single groove in the table. In that case, one wide and one narrow strip are used for the table, and a single guide strip. Other tables have no grooves at all, and on these the auxiliary table may be guided on the edges of the saw table. The most important thing to observe is to make the back fence, against which the work is pressed, exactly square with the dado head or saw. The attachment is also of use for crosscutting wide boards, when the usual guide is also somewhat of a nuisance.

Cardboard Tweezer for Holding Balls

For handling steel balls of the smaller sizes a pair of tweezers can readily be made as shown in the photo. Take a fairly stiff piece of thin cardboard, bend it over to the shape of a pair of tweezers and slip a paper clip of suitable size on each end. It is a good idea to bend the ends double to give a firm support for the clips. The circular ends of the clips will fit the balls and when one is picked up, it will be held securely. Such a pair of tweezers has been found very handy for sorting balls or dropping them down into places where it is difficult to do this with the fingers. A third clip, used as shown, will keep the balls from rolling about the bench.

¶A starting-crank spring of a model-T Ford, applied to the front-wheel brake expander of a model-A, will keep the expander from jumping up and down on rough roads.

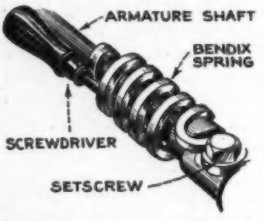
Homemade Floor Wiper Facilitates Janitor's Work of Cleaning Floors

Handy Floor Wiper for Janitors

In a large office building, the janitor uses the simple device shown in the drawing for wiping down the corridor floors. There are fifteen floors in the building, and with this device he has been able to handle alone all the work, which was formerly done by two persons using ordinary methods. The frame of the wiper is made of 2 by 4-in. stock, a swivel section being provided for the attachment of a broom handle. The frame, weighing about 20 lb., is set on an old folded blanket which is then pushed over the floor.

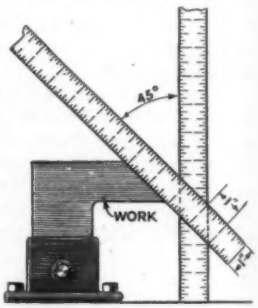
Preventing Kink in Bendix Spring

When installing a Bendix spring, the end of the spring tends to become twisted to the right as the screw is tightened. The spring is then pulled to one side and does not follow the armature shaft. The inner setscrew is more likely to cause this twist than the outer. This screw and spring end should be straight when installed, as they need be removed only when a spring is broken. The spring can be kept straight while tightening the screw, by placing a screwdriver between the spring and shaft, on the left side when seen from above and facing away from the starting motor.



Improvised Protractor Is Made from Two Scales

As the 45° angle is used most in machine shops, it is handy to know how it can be laid off accurately with two rules in the absence of a regular protractor. To do this, I use two standard 12-in. scales, which are exactly 1 in. wide. A line drawn from an inch mark on one side of the scale to the next inch mark on the opposite side, as indicated by the dotted line, would be at a 45° angle to the side of the scale. The second scale is laid across the first in this way and then both sides of the scales will lie at a 45° angle to each other. A scale ¾ in. in width can also be used, but in this case the edge of the second scale is laid across the first so that it runs from an inch mark to the ¾-in. mark in the next higher inch division, or to the ¼-in. mark in the next lower inch division. It is, of course, advisable to clamp the scales together when in use, to avoid slipping.—Harry Moore, Hamilton, Can.



Curing Efflorescence on Brick

Efflorescence, or white deposit on brickwork, has been a source of trouble and worry to builders and architects for years. It was long held that this deposit was caused by salts within the brick and that alternate wetting and drying of the wall caused the salts to be drawn to the surface and deposited in the form of crystals. A large brick-manufacturing company in the east has found a practical remedy for the trouble, and, incidentally, proved that it does not lie in the bricks at all, but in the mortar. If, instead of the ordinary

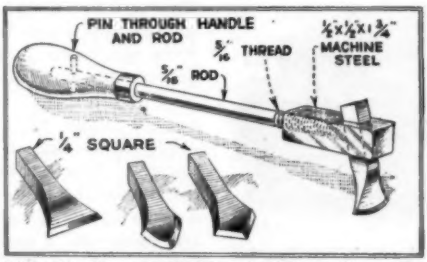
portland-cement mortar, the following formula is used, no efflorescence will appear on the masonry: 1 part cement, ¾ part lime and 4 parts sand. If a stronger mortar is required, use 1 part cement, ¾ part lime and 3 parts sand. The lime changes the soluble salts in the cement into insoluble calcium salts, which are fixed in the mortar and, therefore, cannot dissolve and discolor the masonry.

Grouting Small Machines

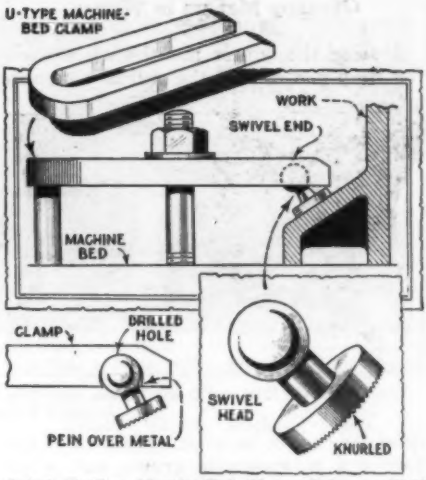
There are only a few substances that are suitable for grouting small machines after they have been set level. It will probably surprise many to know that plaster of paris can be used to great advantage for this purpose, as it will dry quickly and, if given time, have greater load capacity than would be supposed possible. When mixed in the proportion of one-half its weight in water, it will sustain a load of 500 lb. per sq. in. after setting only one hour. When 24 or 30 hours have elapsed, its strength rises to 1,000 lb. per sq. in., and after a few days, it will be 2,300 lb. per square inch.—L. H. Georger, Buffalo, N. Y.

Adjustable Carbon Scraper

For removing carbon from the cylinder heads of motors, for scraping out bearings, or for other purposes, I have found the adjustable scraper shown in the drawing very useful. A suitable handle is pinned to a 5/16-in. rod, and a piece of machine steel, ½ by ½ by 1¾ in. in dimensions, is screwed on the other end, the rod being threaded and the piece of steel tapped for this purpose. A ¼-in. square hole is cut at an angle in the steel endpiece, as shown, to receive the scraper. The rod is then screwed against the scraper to hold it in place. It is a good idea to provide a number of scrapers with edges of different shapes, as shown in the illustration.—Henry S. Laraby, East Haven, Conn.



Adjustable Scraper with Tips of Different Shapes Facilitates Carbon Scraping



Swivel End on Machine-Bed Clamp Helps to Hold Non-Parallel Work Securely

Swivel Ends Improve Machine Clamps

When work is not parallel to the bed of a machine, the usual U-shaped machine-bed clamps are not entirely satisfactory, as frequently only the extreme ends of the clamp bear against the work, with the possibility of their loosening under a heavy cut. A much better clamp, as worked out by the machinists in a large shop, is shown in the illustration. It is a regular clamp except that inverted swivels have been fitted at one end, the heads of the swivels being knurled to grip the surface of the work. The drawing shows exactly how the clamp is constructed and used.

Holding Tacks in Furniture Webbing

Tacks that hold the heavy webbing of overstuffed furniture are often pulled loose by the strain, and some of them even come out entirely. To overcome this trouble, I screwed lengths of 1/16-in. strap iron, 1 in. wide, over the tacks, which were first driven down securely. Wood screws are used for this purpose.—Carl N. Furay, Paterson, New Jersey.

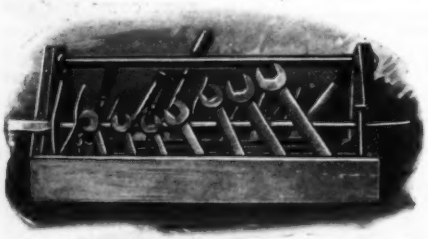
Hauling Manure in Winter

During the winter months when snow lies deep and drifted, the ordinary manure spreader cannot be used. Meanwhile, the barnyard manure pile grows, and when spring arrives and the farmer is busy with other chores, the manure must be hauled. Sometimes other work is sidetracked to make time for the hauling, or the plowing is delayed until the pile has been hauled and spread. To get around this state of affairs and to make better use of idle winter hours, a Wisconsin cattle and sheep raiser devised a handy manure hauler that other farmers will find equally serviceable. It consists of an old water tank of the flat-topped semi-cylindrical kind used to haul water for threshing machines. It is placed on a set of old sleds fitted with a wooden cradle. Dumping a load of manure is a simple matter: On each side of the tank is a large ring securely bolted in place close to the upper edge and midway of the length of the tank. To unload, the team is unhooked from the sled tongue and brought around to the side of the sled. A 12-ft. chain, with a hook at each end, is attached from the evener to the ring in the tank. When the team is started pulling, the tank rolls over and the load is dumped quickly. Rolling the emptied tank back into place is done easily by leaving the log chain attached to the tank but reversing the direction of pull. Thus the team does most of the hard work, and the man does only the guiding.—Joe H. H. Alexander, Madison, Wis.

You Can Easily Haul and Dump Manure with This Handy Tank Sled, Instead of Letting It Accumulate in the Barnyard during the Winter Months

Improvement on the Tool Box

By inserting a thin, tough board at each side of the tool box, leaving a ¾-in. space between it and the side, a handy place is provided for holding wrenches, chisels, pliers and other tools on end, so that they can readily be seen and picked up. This arrangement is only intended to hold the tools while the worker is busy on the job, and when finished they are laid flat.



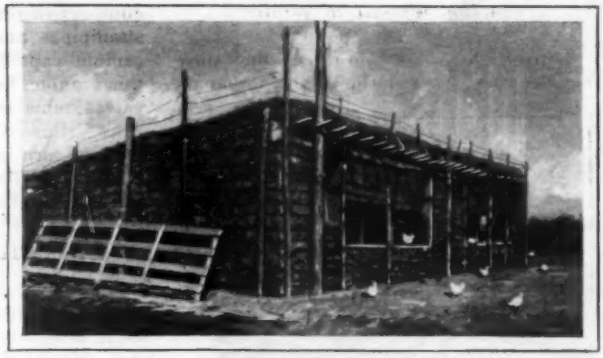
This Tool Box Keeps the Tool with Which You Are Working in View

Compound for Drilling Hard Spots in Steel

Our repair department had done an electric-welding job on a broken rack, and when the workmen tried to drill two holes through the metal at the welding point, it was too hard for drilling. As there were machined surfaces to be taken into consideration, annealing the part was out of the question. All the cutting compounds, such as turpentine and a few other combinations, were tried without success. One of the older men suggested the use of the following compound: powdered sulphur, 1 part; cylinder oil, 1 part, and castor oil, 2 parts. This was found effective.—Frank N. Coakley, Buffalo, N. Y.

Space for Milk Bottle in the Ice Box

In the average ice box the space between the shelves is not sufficiently high to accommodate a quart milk bottle, and it is therefore customary to transfer the milk to a pan or dish which can be set on any shelf. However, by cutting the netting away from the corner of the lower shelf, you can make space for the bottle. It is set on the bottom of the cooling compartment and the neck is pushed up through the hole in the shelf above.—Harold E. Benson, Denver, Colo.



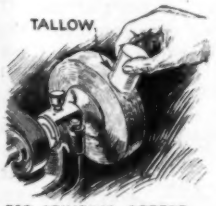
Poultry House Made from Bales of Straw Which Has Proved Satisfactory to Farmer in Arid West

Poultry House Made of Straw

In the arid west where rain seldom falls, a farmer found that a poultry house made of straw was entirely satisfactory. Bales of straw were piled to make the walls, suitable openings being left for the doors and windows. Poles set in the ground on the outside formed supports for wire mesh, which was stretched over the straw to strengthen the walls. The roof was made of timber covered with roofing paper. The poultry house is warm in the winter and cool in the summer.

Two Grinding Kinks

Ordinarily copper cannot be ground on an emery wheel because the metal particles get into the pores of the wheel and glaze it so that it will not cut. This trouble can be prevented by keeping the wheel smeared with tallow during the grinding. The tallow will not interfere seriously with the grinding of other metals on the wheel after the copper job has been completed. Soft rubber cannot be ground on an emery wheel satisfactorily, but can be nicely worked on a wheel having square teeth cut in its periphery. The pitch of the teeth should be about 1 in., which makes each tooth ½ in. wide. Soft-rubber rolls can be neatly finished by swinging them in a lathe and inserting a center grinder in the tool post.—Herbert A. Freeman, Willimantic, Conn.



FOR GRINDING COPPER

SECTION OF NICKED WHEEL USED FOR GRINDING SOFT RUBBER

The broken shank of an old drill can be made into a good screwdriver.

Lifting Pipe with Wrench

When you have to pull out or lift a length of pipe and cannot get hold of it with a chain, clamp or other tool, try the simple method shown. Take the front jaw of a pipe wrench, the shank of which can be slipped inside of the pipe, driving a wedge in as shown. This will cause the coarse threads on the shank to take hold of the pipe so securely that you can pull on the wrench jaw as hard as you like.

Nailing Studs to Plates on the Ground Saves Time and Much Unnecessary Labor

Saving Time in Building

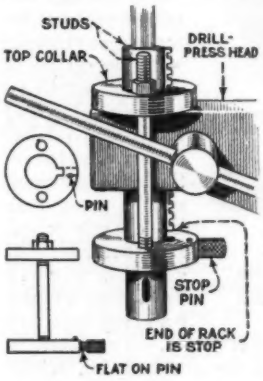
Ordinarily the lower plate of a wall is laid down and nailed in place and the studs, nailed to the top plate, are then raised and toenailed to the lower one. This involves unnecessary labor and improper nailing is often the result. The drawing shows an improved method. The lower and upper plates are laid side by side and are marked off with a square for the location of the studs, which are then placed between the plates and nailed in place securely. The window headers are next fitted in place and nailed, and finally the cripples. The section is then ready to be raised, after which the lower plate is nailed down.

Auto Valves in Irrigation Standpipes

After installing an underground cement-pipe irrigation system in his apple orchard, the owner of a mountain ranch found that he had to cement caps on the top of each standpipe to keep the water from overflowing. In his particular case, there was such a drop from the wells back in the mountain that the water came through the irrigation pipe with considerable force, compressing the air in the tops of the standpipes and occasionally causing the cement caps to blow off. To overcome this trouble, he got a number of old auto-valve stems and set them in the caps. These allowed the air to escape, relieving the pressure inside. Of course, the valve stems also allowed some of the water to run out, but this did not matter.

Drilling Holes of Varying Depths

It is often necessary to drill two holes of different depths in a piece with the same drill. With the use of an ordinary stop this cannot easily be done. A special stop of the kind shown in the drawing, when used in conjunction with the regular stop on the machine, allows the drilling of two such holes, and, if necessary, also a through hole. Two collars are drilled to fit the rack spindle, and keyways are cut in them to clear the rack. Both collars are drilled and tapped for studs, one on each side, and the lower one is drilled into the slot to take a knurled stop pin. The pin is kept from coming out by means of a small retaining pin which bears against a flat on the stop. In use, the regular stop of the drill press controls one depth and the stop just described the other depth. When feeding down to the regular stop, the pin is pulled out and pushed in again for the next depth. It will be seen that the end of the rack is used as a stop surface, and that, when the pin is pulled out, the spindle is free to move down to drill a through hole. The nuts on the studs are used to adjust the stop.—Harry Moore, Hamilton, Can.



¶Starting a bolt in places hard to get at is much simplified if the head is slotted with a hacksaw so that the bolt can be turned with a screwdriver.

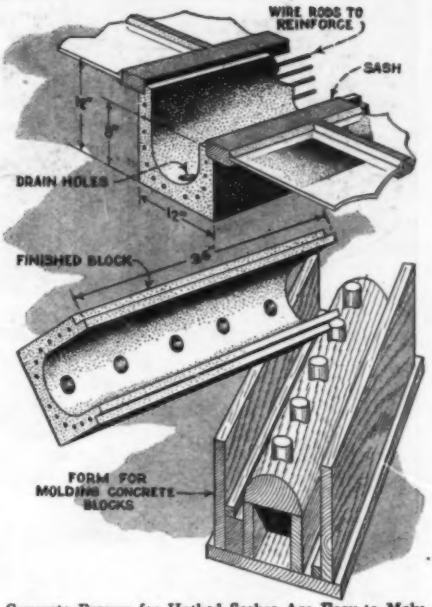
Vacuum Cleaner Useful in the Workshop

I have a workshop in which there are always so much sawdust and shavings on the floor that I use a vacuum cleaner to pick them up. At first I had considerable difficulty with this method, as the cleaner also picked up nails and bits of metal, which chipped the aluminum fan. To prevent this, I magnetized a length of iron rod which was cut to the length of the bell of the cleaner. I then soldered two short pieces of steel wire to the ends of the rod, after which the wire was bent to clip into the bell. The magnetized rod picks up all nails and other iron and steel chips. The attachment can be removed without difficulty.—Eugene K. Goodwin, Los Angeles, Calif.

Getting Trucks Out of Mud Holes

On a job in Central America, where a number of self-dumping trucks were used, some of the drivers have a novel and effective method of getting themselves out of mud holes. They merely let the power hoist of the truck do the work. The dump body overhangs the rear point of support so that when the front part of the body is raised for dumping, the rear end goes downward. Taking advantage of this, the drivers put timber struts under the body as indicated in the drawing. The body, bearing down on the struts, thrusts the wheels out of the mud, permitting the drivers to lay planks under them.—R. C. Hardman, San Jose, Costa Rica.

Novel Method of Raising Self-Dumping Trucks Out of Mud Holes



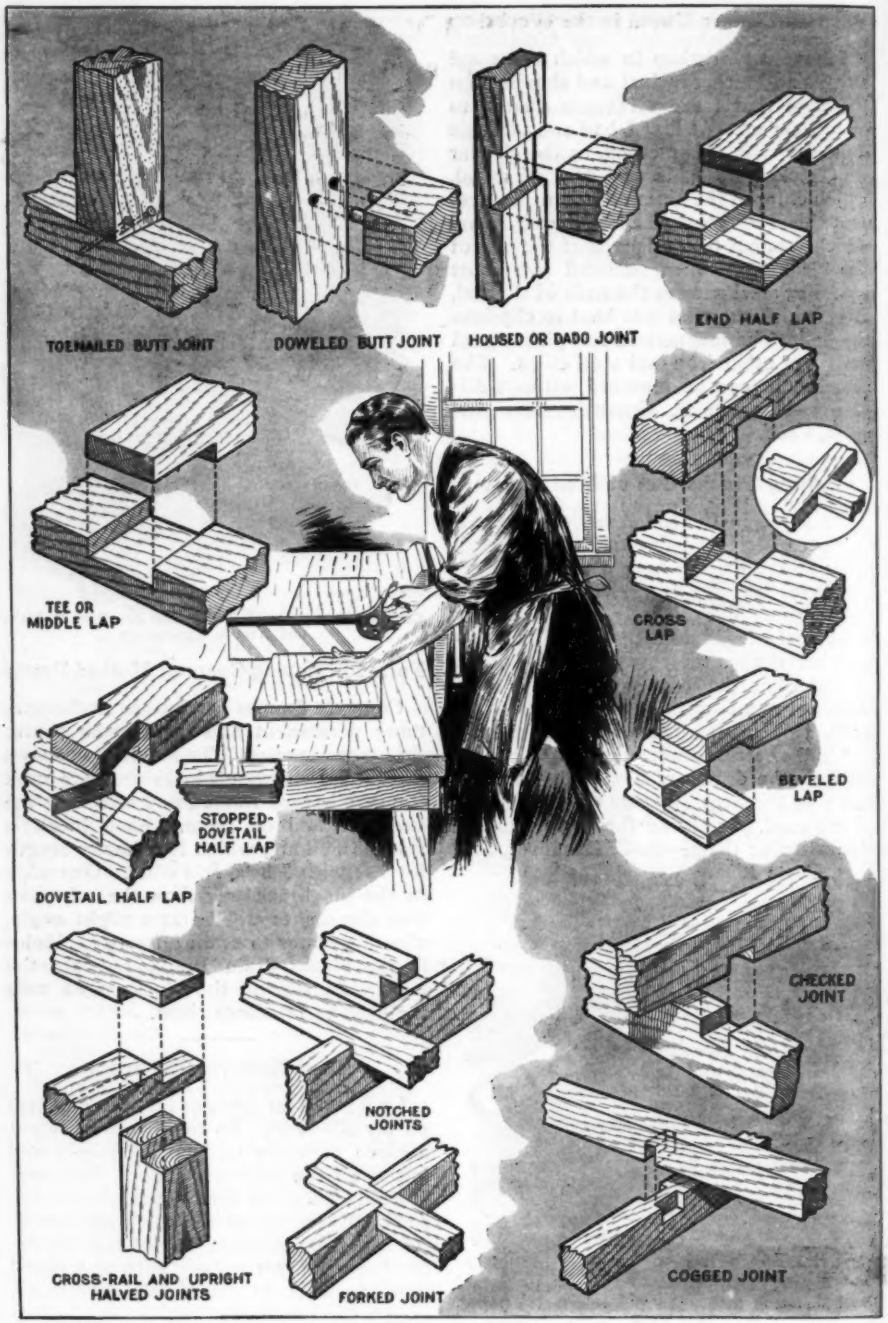
Concrete Frames for Hotbed Sashes Are Easy to Make and Neat in Appearance

Form for Making Concrete Hotbed Frame

Concrete frames for hotbed sashes are more permanent and look much neater than wooden ones. The illustration shows a form for molding blocks that are used to make hotbed frames, and also how the sash are laid on them. Each block is made 3 ft. long, which is a handy length for use with 3 by 6-ft. sashes. One edge of the block is lower than the other, so that the sashes will be at a slight angle, allowing water to drain off easily. Holes in the blocks drain the water into the earth. In making the blocks, wire rods are used to reinforce them.

Lard Removes Tar Spots

I got some tar spots as large as quarters on my silk shirt. To remove them, I put a piece of white lard on each spot and left it on the shirt overnight. The next morning I washed the shirt in clean soapsuds. Every trace of tar disappeared. After this experiment, I tried lard for removing tar spots on my auto and found this, too, entirely successful.—C. Latour, Jr., Plattsburg, N. Y.


TOENAILED BUTT JOINT
DOWELED BUTT JOINT
HOUSED OR DADO JOINT
END HALF LAP
TEE OR MIDDLE LAP
CROSS LAP
STOPPED-DOVETAIL HALF LAP
BEVELED LAP
DOVETAIL HALF LAP
CHECKED JOINT
NOTCHED JOINTS
CROSS-RAIL AND UPRIGHT HALVED JOINTS
FORKED JOINT
COGGED JOINT

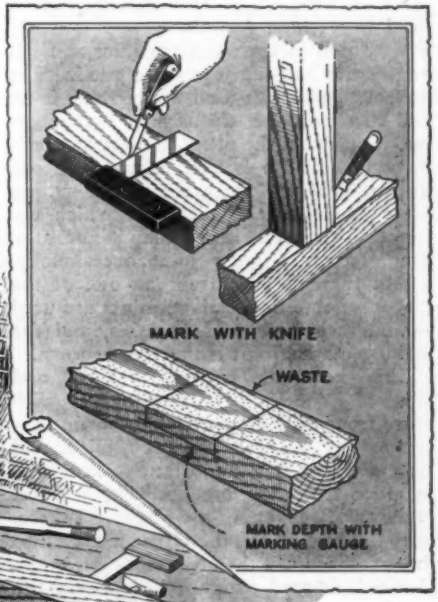
Wood Joints for the Amateur

PART I

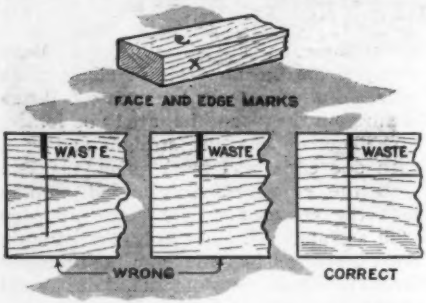
THE FIRST problem encountered by the amateur woodworker, after he has unpacked his new "home workshop," and is all set to "make things," is "what shall I make?" That problem disposed of, he is immediately confronted by another, and, to the average amateur, a much more formidable one, "How shall I put it together?" The answer to that problem it is the purpose of these articles to supply.

To the man who has a flair for making things, woodwork joints present a fascinating subject for study. To many amateurs, and some tradesmen also, a joint is merely a means of fastening two or more pieces of wood together. It is more. There are a number of ways, for example, in which to joint two boards edge to edge, but, for any particular purpose, there is usually one way that is much better than the others, and therefore the amateur should not only know how it is done, but also why.

The first joints to be described are framing joints, and the first things to be learned about these, as with all joints, are: Mark always from the face side or edge; mark with a knife; saw in the waste. When setting out the pieces that are to be joined, first plane up one face straight and true, then one edge, and mark them, the face with the conventional glorified comma that the tradesman uses, and the edge with a cross. All measuring and gauging must thereafter be done from the prepared faces and edges. A moment's thought will show why this is necessary. Next, whether the marking off be done with the square or by laying one piece on top of the other, use a sharp knife, not a pencil. Third, and very important, always saw or cut in the waste, or the part of the wood that will be cut away to make the joint. The reason for this will be apparent after glancing at the illustration on page 346. If the cut is made on the outside of the line, on an end half lap, for example, the recess will be too wide by the thickness



of the saw kerf; on a middle lap, if both cuts are made outside the line, the joint



will be too wide by two saw kerfs. When the cuts are made just inside the line, the recess will just fit the mating piece.

The simplest framing joint is the toe-nailed butt joint, but where more strength is necessary, the doweled or the housed joint is used. The first-named joint is used in nothing but the roughest work. Where two pieces come together at right angles the half-lap joints are good. The dovetail half lap is used where there is an end strain on one of the parts that might pull it out from the other, and the stopped-dovetail half lap is used where it is not desired that the end grain of the mating piece show on the piece in which the socket is cut. The beveled lap is not often used, but is a good joint occasionally, where there is end strain on one of the pieces. Sometimes halved joints are used to join crossrails and uprights, and the making of this joint is therefore shown.

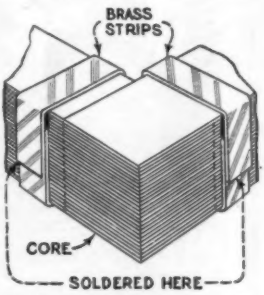
The notched, cogged, forked and checked (cheeked) joints are met with more frequently in carpentry than in cabinetmaking, and are used on joists and rafters where it is important to keep one member from moving endwise, without materially weakening the pieces. Where, in the halved joints, the pieces are let into one another until the faces coincide, in the checked, cogged and notched joints, the notches are merely cut deep enough to keep the members from moving.

Circuit Breaker for Testing Auto Wiring

In the absence of a regular outfit for testing the electrical circuits of an auto, you will find a Delco overload circuit breaker, provided with leads and test prods, to be a good substitute. This method eliminates the dangers of short circuits attendant upon the use of a single length of wire for making such tests. If the circuit is in good condition, the breaker will start clicking.

Clamping Transformer Laminations

Magnet and transformer cores made of layers of sheet iron are usually bound with tape, fastened with clamps or machine screws passed through holes drilled through the core. Tape makes an insecure assembly, and the use of clamps involves too much extra work for the experimenter, besides making a bulky job. Drilling holes through the core is not advised, as this reduces the effective cross section of the core and develops eddy currents. The writer has devised a simple method of keeping the laminations together tightly, which is illustrated in the drawing. The laminations, after being stacked up, are clamped tightly in a vise. Then a thin strip of tin or sheet brass is bent around the core, allowing a small overlap. The inner surfaces of the overlap are wiped with solder, after which a hot soldering iron is held on the overlap for a few moments until the solder melts. After cooling, the core is removed from the vise and is clamped in some other position, and another strip is soldered around it in the same way. If done carefully, this method insures a very tight and immovable assembly, and if the core is to be magnetized from an a.c. source, no perceptible hum will be noticed. This form of core assembly has been used on small a.c. magnets, motor fields and transformers. The width and thickness of the strip must be governed by the size of the laminations to be bound. Sheet metal from tin cans, cut about ⅜ in. wide, has been found satisfactory for ordinary work.—Emil J. Schau, Elizabeth, N. J.

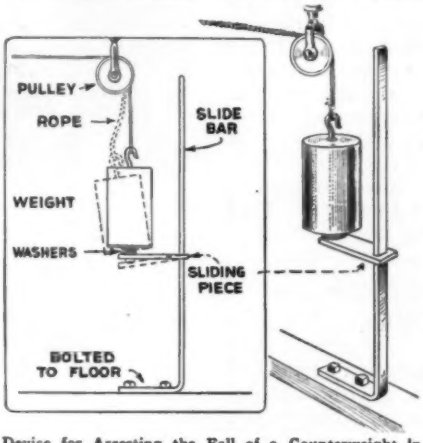


Safety Oil-Hole Covers

In a small woodworking shop, ¾-in. capped pipe nipples were used as oil cups on some of the machines. Several times the caps of the nipples were accidentally dropped into the running machines, causing considerable damage. In the junk pile, a length of heavy cardboard tubing was found that fitted on the nipples snugly. This was cut into 3-in. lengths, plugged at one end with a short wooden peg and then shellacked. These covers were slipped over the oil cups, and if one happened to fall into the machine little or no damage resulted, except to the paper cover.

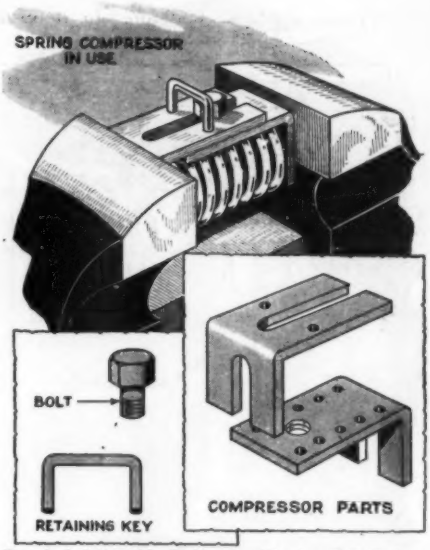
Catch for the Counterweight

A counterweight suspended in a position where it might injure someone in case it fell, is always a source of danger. Often it is possible to adopt the illustrated device, which will check the fall of the weight. A length of flat iron is bent at right angles near one end, which is drilled for screws used to attach the piece to the floor as indicated. A slide bar made to slip on the bracket, is bolted to the underside of the counterweight so that, in ordinary use, when the latter is moved up or down, the slide bar will not bind on the bracket. However, if the rope or chain breaks, the counterweight suddenly bears down heavily on the slide bar and causes it to bind on the bracket, checking the fall of the weight. The handiest kind of weight for this purpose is a round one, drilled lengthwise through the center for a long bolt, which has the upper end bent to the shape of a hook. The lower end, which is threaded, slips through a hole drilled in the slide bar, and a nut is used to keep the assembly together.



Device for Arresting the Fall of a Counterweight in Case the Rope Breaks

¶To find the distance between centers of two gears, add the number of teeth, divide by two and then by the diametral pitch.



Practical Adjustable Holder for Keeping Coil Springs Compressed

Adjustable Holder for Compressing Coil Springs

For keeping coil springs compressed, the adjustable holder shown in the drawing is a great improvement over the ordinary method of wiring the spring and then cutting the wire after the retaining nut is adjusted. The holder consists of two angle clips, one fitted with a screw and the other having an elongated slot to slip over the screw. Holes are drilled in the two pieces as shown, and a retaining key, bent to a U-shape to fit the holes, is provided. In use, the holder is slipped over the spring and both are compressed in a vise as shown. The key is slipped into the proper holes and the screw is tightened to lock the holder on the spring, after which it can be removed from the vise.—G. A. Luers, Washington, D. C.

Improvised Device for Scribing a Circle, the Center of Which Is over a Hole

Centerless Circle Marker

It is sometimes necessary to scribe a circle around a hole that cannot be plugged. In such cases the method shown in the drawing will be found successful. Get two pieces of wood, one a little longer and the other a little shorter than the radius of the circle to be scribed. Tack the pieces together with a brad as indicated and drive another brad in the end of the longer piece, the distance between the brads being exactly equal to the radius of the circle. To use this marker, place the brad on which both pieces pivot in the center of the hole, which can be determined accurately by means of a rule. Hold the shorter piece down securely and revolve the longer one so that the brad scribes the circle.

Plaster of Paris Purifies Gasoline

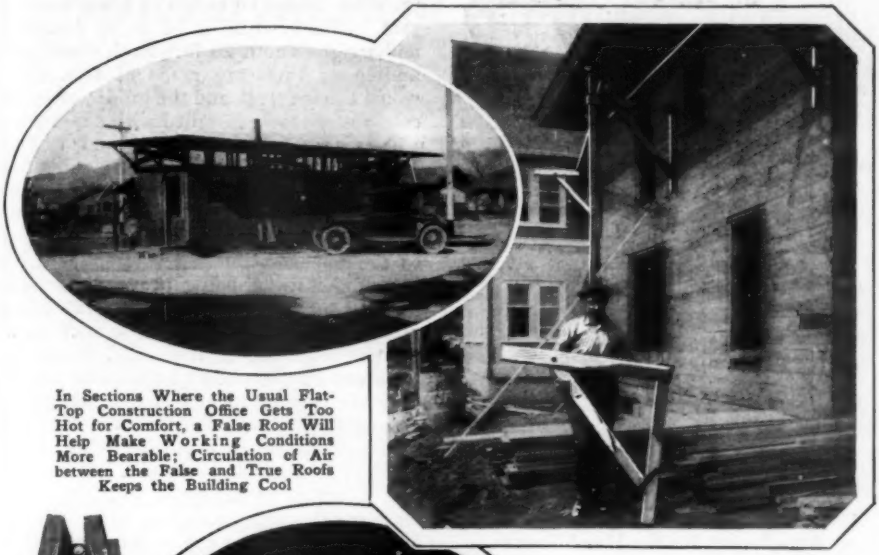
Usually gasoline used for dry-cleaning garments at home is thrown away, but this is not necessary, for it can be purified and used again. Strong soda or acid solutions have been recommended to do this, but, although they may cause the dirt to settle, there is some risk of the dirt mixing again with the fluid when it is poured off, with consequent damage to garments cleaned in it. By using ordinary plaster of paris as a settling agent, all possibility of such a risk is eliminated. The powder, when thoroughly mixed with the dirty gasoline, will cause the dirt to settle within twenty-four hours, leaving a pure, amber-colored liquid that can be used for cleaning the finest fabrics.

Clip for Catching Screw-Machine Work

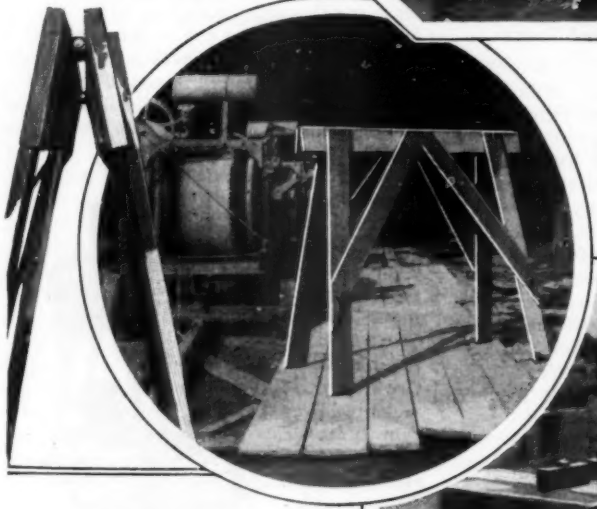
A screw-machine operator made the spring clip shown in the photo to save his fingers when catching work parted from the rod. The particular work shown is finished with a pointed end, and to prevent the end from being damaged in falling, it was necessary to grasp it with the fingers a moment before the separation from the rod. Threaded work, however, is apt to cut the fingers no matter how lightly the piece is touched, and, in any case, the fingers soon become sore from continued contact with the running work. This device, therefore, is a sensible precaution. It is made of flat spring steel, bent to form a nest for the work. Just above this point a hole is drilled so that a short length of wire can be inserted and bent over at both ends. This causes the clip to snap over the work easily and prevents its being accidentally pushed too far over the work. In use, the clip is held in the right hand, while the parted tool is being operated by the left, and snapped over the work a moment before it is cut off. The clip acts as a brake on the work and stops it from revolving immediately it is cut off.

—Harry Moore, Rosemount, Can.

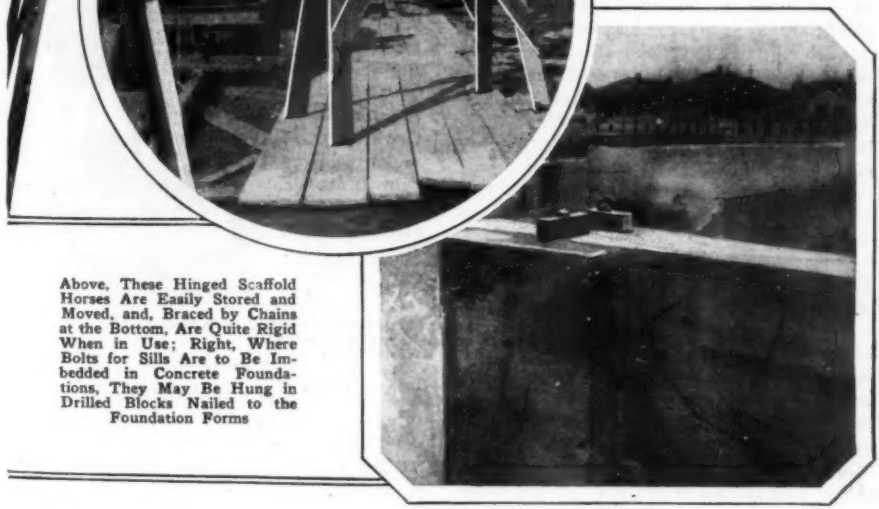
Helpful Hints for Builders



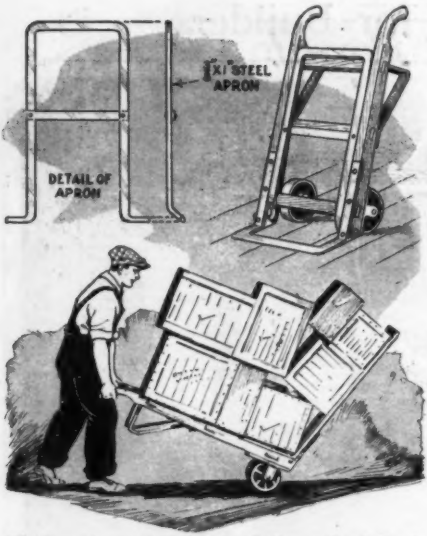
In Sections Where the Usual Flat-Top Construction Office Gets Too Hot for Comfort, a False Roof Will Help Make Working Conditions More Bearable; Circulation of Air between the False and True Roofs Keeps the Building Cool



Above, a Well-Built Scaffold Bracket That Is Easily Moved About; the Doubled Horizontal Arm Measures Four Feet and the Vertical One Three Feet Six Inches; the Brace Is Haunched into the Vertical Arm and Fastened by Straps; Other Joints Are Bolted; a Hook on the Horizontal Arm Engages with the Frame Timbers



Above, These Hinged Scaffold Horses Are Easily Stored and Moved, and, Braced by Chains at the Bottom, Are Quite Rigid When in Use; Right, Where Bolts for Sills Are to Be Imbedded in Concrete Foundations, They May Be Hung in Drilled Blocks Nailed to the Foundation Forms



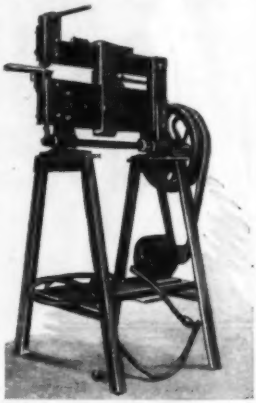
Flat-Iron Apron, Attached to Ordinary Hand Truck, Increases Its Capacity

Attachment for the Hand Truck

The ordinary hand truck, for moving boxes, barrels and freight of all kinds, is not of much use for moving light, bulky packages, which form the greater part of express shipments today. I have devised an attachment for the hand truck which more than doubles its capacity without interfering with its ordinary use. It consists of a hinged apron made of 1 by ⅜-in. steel bar. It is attached by drilling a hole in each side of the truck and springing the offset ends into the holes. When not in use, it is folded against the truck and held by a simple latch on the top crossbar of the truck.—J. Joseph Alpine, South Amboy, New Jersey.

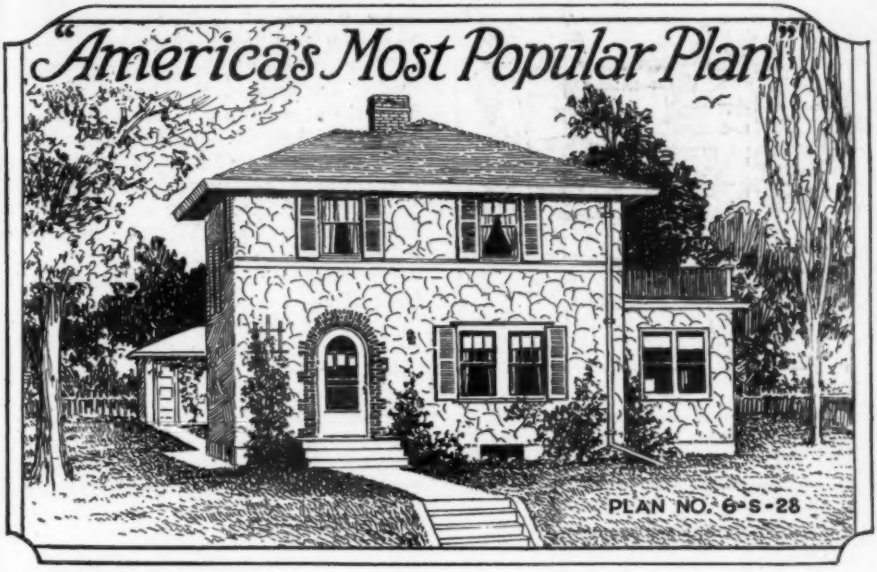
Power Shears Made in Small Shop

We occasionally have to cut numerous pieces of band iron and steel-sheet stock, from 1/16 to ⅛ in. thick, and in order to eliminate hand work, we made the power shears shown in the photo. The supporting frame is of angle iron, the lower member of the frame being a piece of 1 by 6-in. cold-rolled steel, while the upper member was made of 3-in. mild steel, although a somewhat heavier piece might be preferable. The throat depth is 7 in. the shaft is 1⅛ in., and the travel of the lower ram ¼ in., an eccentric turned on the end of the shaft being the means of operating the ram. The flywheel is 14 in. in diameter and weighs about 20 lb. Both the upper and lower rams are made of 1-in. cold-rolled square steel, and the guides of ½-in. cold-rolled stock, fastened with capscrews. The center tie of the frame is made of two pieces of ½ by 2-in. mild steel, welded top and bottom to pieces of 1-in. square cold-rolled stock. The tie is brazed to the lower frame member, but is not rigidly fastened to the upper member, an adjustment on top of the frame being provided for setting the knives as desired. The latter are pieces of self-hardening steel, such as is used in lathe cut-off tools, and are set in slots cut in the ends of the rams where they are held by means of two setscrews. One of the knives should have a rounded end and the other a cutting edge, from ½ to 5/8 in. long and straight. An eccentric, operated by a handle, provides a release for the upper ram and knife when it is desired to start a cut in the center of a sheet and stop cutting before reaching the edge. The shaft speed is about 500 r.p.m., and the bearings are made from steel tubing welded to pieces of flat steel. The bearings are large enough to permit babbitting the shaft in place. There is a screw adjustment on the connecting rod between the eccentric and the lower ram to set the knife at the right height. A ¼-hp. electric motor is used to drive the shears.—Edwin Kilburn, Spring Valley, Minn.



¶Two blocks of wood, fastened between the jaws of a small clamp, will be found convenient for holding newly applied patches on an inner tube while the cement is setting.

"America's Most Popular Plan"



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A VOTE taken among speculative builders, contractors, architects and home owners would no doubt show the plan for this house leads in popularity. Why? Because like an automobile that promises "most miles per gallon," so, too, houses built from this plan may be described as "most house per dollar."

You see this house with variations in almost every city and town. It appears in brick, stucco, wood siding, shingles and cement. Sometimes the sun porch is built to the rear. Again it is built to the side, as shown in the picture. Frequently it is placed at the front of the house. But always the same general plan for room arrangement is followed.

The reasons for this nation-wide popularity are worth looking into, provided you are planning to build or buy and want to make your dollars count. What are those reasons?

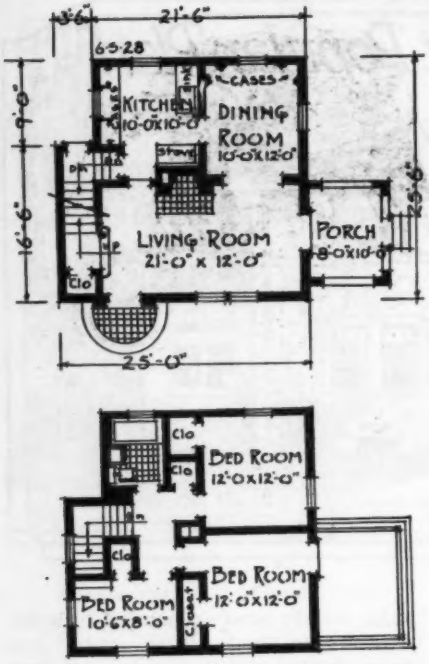
In the first place, the house is practically square, twenty-five feet wide by twenty-five feet six inches deep. Square houses are the most economical to build. There are no crooks, turns, set-offs and no complicated roof to require extra time and labor by workmen. Labor usually amounts to around fifty per cent on nearly every job. If you can save on labor, you keep down building costs. This is also true in the saving of materials.

In the second place, the house is a two-story dwelling. The second story gives it size and impressiveness. That is important because, if at any time you wish to sell, you will find impressiveness a desirable sales factor. Buyers usually want an "eyeful" for their money.

Third, the house contains the minimum number of rooms demanded by the average family. What are those rooms? At least three bedrooms or three bedroom equipments. In addition, a living room, dining room, kitchen, bath and sun room. In passing, it is well to remember that even though breakfast nooks have replaced the dining room, nevertheless most

A SPECIAL OFFER

To help our readers get started on one of life's most glorious experiences—building and owning a home—Popular Mechanics Magazine will supply readers a one-sheet blueprint of "America's Most Popular Plan" for $1 (regular price $2), if ordered before Feb. 1. This blueprint does away with the necessity of first purchasing a complete set of plans to find out whether you can afford to build. It contains floor plans, elevations, a section, detail, size of joists, studs, etc., and also a brief specification. Submit it to tradesmen and dealers for building estimates.



people want a dining room as well. People who build houses to sell know this and usually include both a breakfast nook and a dining room.

Fourth, the arrangement of rooms in this house is as compact as sardines in a can. There is practically no unused space. Note how the lower floor opens up into one large living area. The sun porch adds extra length to the living room. Direct communication between front door and kitchen is a feature. All bedrooms have outside exposure. The inside fireplace is a stroke of economy by the designer. It accommodates a flue for the kitchen range. While no vestibule is provided, the owner can easily add one if he lives in a climate where vestibules are essential.

Search as hard as you may for waste space, you will find every inch of floor space in this house is working all the time. In fact, the plan is a model of economy both in construction and use of space.

The house can be placed on a lot forty-five feet in width if the sun porch is built as shown. If, however, the sun room is built to the rear, adjoining the dining room, you can place the house on as narrow a lot as thirty-five feet.

Now add up all the space and money-saving features in this house, and you have the answer to why this plan is often said to be America's most popular design. The plan, style and equipment are all in line with the average pocketbook. Resale value is high according to people who build houses to sell. What more can you ask for?

As shown, the house is planned to be built of wood frame with stucco on metal lath for outside walls. Siding or shingle exterior would look well. The roof is wood shingle, although composition shingles may be laid in variegated patterns. The house is fully insulated.

The illustration shows a detached garage to the rear of the lot. If, however, the sun porch is built off the dining room, it is possible that a one-car garage can be placed beneath the porch. This might require some excavation or a lot with a drop in grade.

The plan lends itself to several simple changes to meet individual tastes. The sun porch is easily converted into a library or den with only slight alteration, or, by replacing the wall between it and the living room with a wide alcove, it becomes an attractive music room and greatly enlarges the apparent size of the living room.

The roof of the porch, shown with a balcony railing, can be changed into an attractive sleeping porch, either at the time of building or later. The conversion may be permanent, or done with a framework of iron pipe, with canvas roof and side walls, easily removed if the sleeping porch is not to be used in cold weather.

And now about the cost to build. The house has been erected complete for $5,000. Costs, however, vary with location, equipment and materials used. In some localities the cost may be more; in others, perhaps, savings can be made.

EDITOR'S NOTE: Popular Mechanics Magazine has prepared a new plan book, "Twenty Popular Low Cost Homes and Ten Commandments for Home Builders." These are selected homes and show labor, space and time-saving ideas. They are $5,000 homes and less. Send 10 cents in stamps to cover postage. Address Building Editor.